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Circle West Wildlife Monitoring Study

First Annual Report

For the Period March 1, 1978 - March 7, 1979

Circle West Technical Report No. 4

Prepared by
Larry S. Thompson
Biological Sciences Coordinator
Facility Siting Division
Montana Department of Natural
Resources and Conservation
32 South Ewing
Helena, Montana 59601

December, 1979

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Figure 1

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INTRODUCTION

In March of 1978, the Montana Department of Natural Resources and Conservation (DNRC) entered into an agreement with Dreyer Brothers, Inc. to conduct a long-term wildlife monitoring study of the Circle West area, McCone County, Montana (Appendix A). This monitoring study is essentially a continuation of the Circle West Wildlife Baseline Study (WBS), 1978 (Circle West Technical Report No. 2). However, where the baseline study was intended to provide data required by the DNRC relative to siting and evaluation of a coal conversion facility, as well as data required by the Montana Department of State Lands (DSL) pursuant to the Strip Mine Siting and Strip Mine Reclamation Acts and pertaining to the actual coal mine, the monitoring study was designed solely to meet the requirements of DSL. Field effort was, therefore, limited primarily to the 174.3 km² (99 mi²) Mine Study Area (referred to hereafter simply as "the study area") described in the WBS; the only data gathered outside this area were obtained on the roadside wildlife survey control routes and incidentally during travel to and from the study area.

The wildlife baseline study was designed to provide a description of the wildlife resource of the study area as it exists before mining, and to allow a priori prediction of the impact which may result from the proposed mine. The long-term monitoring study was designed primarily to document the nature and magnitude of actual impact and to allow determination of the success of reclamation efforts in restoring pre-mining conditions. Also, since wildlife populations fluctuate dramatically from year to year, and the one-year baseline study cannot measure the magnitude and periodicity of such fluctuations as weather-related changes and natural population cycles, the long-term monitoring study provides an essential continuation and refinement of the baseline study.

In order to document impacts, the monitoring study must be capable of discriminating those changes attributable to the proposed development from those reflecting natural variation; that is, it must be capable of detecting a "signal" against the background "noise" of biological systems. This may be done by measuring and comparing long-term changes in species and community parameters for control (undisturbed) and experimental (disturbed) areas. It is assumed that natural variations will affect both types of sites similarly. Should experimental plots show a significantly different long-term pattern of variation following disturbance, that difference should be attributable to the disturbance.

The plan of study for the monitoring program was approved by DSL in March of 1978 (Appendix B). It was designed to make maximum use of the data collected during the baseline wildlife study and the methods and techniques developed during this study. The approach taken involves long-term sampling, both of areas on the proposed mining area (experimental sites) and outside this area (control sites) in order that mine-related changes may be distinguished from natural region-wide biological fluctuations.

While administrative authority for the Circle West study has been transferred from DNRC to DSL, DNRC is continuing to coordinate the wildlife and vegetation monitoring studies.

METHODS

Field techniques and analytical methods followed those described in the WBS. Six biologists worked in the study area at various times during the study period, which extended from March 1, 1978 to March 7, 1979. A brief summary of methods employed for individual study segments follows.

General Ground and Aerial Surveys

Monthly aerial flights were made over the mine study area through October; two flights were made during January and one during February. All observations (both ground and aerial) of large mammals, upland game birds, and raptors were recorded on the same data sheets and maps used during the baseline study, and identified in the "level" column as to area, using the revised code shown in Appendix B of WBS. Locations of all recorded observations within the mine study area were plotted on 7.5' maps. All data (including data sheets and maps) are on file with DNRC.

Waterfowl Survey and Census

All waterfowl observations were recorded on the waterfowl data sheets used in the baseline study. In addition, censuses were taken of bodies of water in the mine study area three or more times during the study period. Censuses were taken at least once between May 10 and May 22, to census early nesters such as mallards and pintails; once between 2 June and 20 June to census other species; and once between 15 July and 30 July to census broods as suggested by Brewster et al. (1976), Stewart and Kantrud (1973) and Hammond (1969: 247-248) were recorded separately. The minimum number of indicated pairs for each species and for each water body was assumed to equal the number of broods observed plus the smallest of the census estimates for each species during the appropriate time period (if greater than the number of broods). These data were used to determine year-to-year, weather-related changes in waterfowl use and density in the area.

Monitoring of Raptor Nests and Leks

Raptor nests located in the mine study area during 1977 were visited in June to determine productivity. Leks located in the mine study area during 1977 were visited in April to determine the number of birds in attendance.

Roadside Wildlife Survey

Each of the five roadside wildlife survey routes were run in May, June, and July, 1978, using methods outlined in the WBS and following the 1977 dates as closely as possible. The theoretical total number of species (St) was determined for cumulative sample abundance distributions as breeding-season (May-July) data were pooled for (1) each route, and (2) the five routes combined. The average sample abundances of each indicator species were plotted in order to graphically portray the nature and magnitude of year to year fluctuations.

Factor analysis (principal component analysis) was used to analyze between-year (and, in some cases, between-month) differences in breeding season habitat use for selected species. May-July sample abundance data for each of the 250 roadside wildlife survey stops, as well as habitat descriptions for each stop, provide the data base. Habitat descriptions included in the analysis included elevation and the percentages of the following habitat categories: grassland, cultivated, saltgrass, blue-bunch wheatgrass, Rocky Mountain juniper, little bluestem, badlands, big sagebrush, badlands plus big sagebrush, silver sagebrush, big sagebrush plus silver sagebrush, horizontal juniper, wild hayland, buildings, snowberry/rose, cattail marsh, alfalfa, tall shrubs, trees, and tall shrubs plus trees.

Breeding Bird Census

In 1978, the five breeding bird census grids established in the baseline study were censused using standard methods.

Small Mammal Trapping

Eight small mammal traplines (numbers 15, 17, 18, 20, 33, 34, 35, and 44) were snap-trapped for three consecutive nights in May and again for three consecutive nights in October using methods outlined in the WBS.

Lagomorph Survey

The two lagomorph survey routes were run consecutively on each of three mornings (October 6-8) beginning with the mining area route at 4:00 A.M.

WEATHER

Table 1 summarizes 1977-78 changes in certain weather parameters at the Circle and Fort Peck recording stations. The weather pattern during 1978 had a marked effect on vegetation, which in turn affected wildlife populations. The winters of 1977-78 and 1978-79 were "severe" in comparison to the "moderate" winter of 1976-1977 (Table 1). The National Weather Service at Glasgow recorded only eight days with at least 13 cm (5 in) of snow on the ground during December and January of 1976-1977, compared to 50 such days during December and January of 1977-1978. The average temperature in January 1977 was -16°C (3°F), (which is 3°C (6°F) below the norm), while the average in January 1978 was -19°C (-2°F), (which is 6°C (11°F) below the norm). April-July precipitation in 1978 was nearly twice that recorded in 1977 for both the Circle and Fort Peck stations. Precipitation at Circle during the spring and summer months (April through July) was 33.43 cm (13.16 in), or 10.16 cm (4.00 in) above normal. Thus, 1977 was an abnormally dry year following a mild winter; 1978 was a wet year following a severe winter.

Table 1. Summary of climate and weather data, Circle West Area.

	Norm	1977	1978
Annual Precipitation			
Circle	31.67 cm (12.47 in)	37.13 cm (14.62 in)	50.11 cm (19.73 in)
Ft. Peck	29.26 cm (11.52 in)	24.92 cm (9.81 in)	50.44 cm (19.86 in)
April-July Precipitation			
Circle	13.13 cm (5.17 in)	15.57 cm (6.13 in)	32.79 cm (12.91 in)
Ft. Peck	13.51 cm (5.32 in)	9.40 cm (3.70 in)	30.96 cm (12.19 in)
Average January Temp.			
Circle	-10.67°C (12.8°F)	-15.72°C (3.7°F)	-17.33°C (0.8°F)
Ft. Peck	-11.11°C (12.0°F)	-14.61°C (5.7°F)	-16.39°C (2.5°F)
Average July Temp.			
Circle	20.83°C (69.5°F)	21.72°C (71.1°F)	19.94°C (67.9°F)
Ft. Peck	22.06°C (71.7°F)	22.50°C (72.5°F)	21.06°C (69.9°F)
No. of days in Jan. with $\geq$ 13 cm (5 in)			
Snow on the Ground			
Circle	NA ^{1/}	28	31
Ft. Peck	NA	NA	NA

^{1/} NA=not available

VEGETATION AND HABITATS

The relatively cold, wet spring and high soil moisture had a marked effect on vegetation and habitats of the study area in 1978. Plant phenology was at least one week behind that of 1977; this was especially noticeable in the case of silver buffaloberry (Shepherdia argentea), which was only beginning to leaf out in mid-May. Grasshopper populations were markedly down from summer 1977 levels, probably as a result of winter kill; they were rare until mid-July, by which time they were common but not nearly as abundant as in 1977. This combination of increased soil moisture and reduced grasshopper grazing pressure resulted in luxuriant grassland development which was truly remarkable in comparison to the 1977 condition. Where most blue grama (Bouteloua gracilis)/needle-and-thread (Stipa comata) grasslands averaged only 2-15 cm high in 1977, the same areas in 1978 supported vigorous grasses nearly 1 m in height. Needle-and-thread development was most spectacular, and the needle-and-thread/blue grama grassland breeding bird census plot resembled a mature wheatfield from a distance. Stockponds in the area were full or nearly full throughout the 1978 season, and supported much higher densities of waterfowl than in 1977.

A quantitative description of 1977-1978 changes in vegetation, as well as photographs of representative grassland types, has been presented in the 1978 vegetation monitoring study annual report (DNRC 1979).

RESULTS AND DISCUSSION

WILDLIFE SPECIES PARAMETERS

Tabular Summary

Data obtained for the 199 species of vertebrates observed through the monitoring period (5 species of amphibians, 7 of reptiles, 160 of birds, and 27 of mammals) are summarized in Tables 2, 3 and 4. The types of data included and the abbreviations used are as described on pp. 41 and 56 of the WBS. Note that any additions or changes to the baseline data resulting from the first year's monitoring study are printed in italics.

Table 5 summarizes the cumulative numbers of species encountered in the study areas during the baseline study and through the first monitoring period. It can be seen from this table that 23 new vertebrate species were added to the species list as a result of the monitoring effort; these include 1 species of amphibian, 21 of birds, and 1 mammal. Most of the new species added (14, or 61% of the 23 new species) were migrant birds.

Narrative Accounts for Selected Species

Data in addition to that present in Tables 2 through 4 were obtained for certain species, and are summarized in the following species accounts. In general, information presented here is limited to nesting raptors, upland game birds, and ungulates, and is primarily an assessment of changes occurring in the mine study area since the baseline study.

Red-Tailed Hawk. The nest located on the proposed mining area in 1977 was active in 1978 as well, and produced at least two young. The other nest in the mine study area was not visited in 1978.

Swainson's Hawk. Swainson's hawks were frequently seen in the mine study area, but no active nests were located. A pair was observed building a nest in a cottonwood near the end of the Circle Route on May 20, 1978, but the nest was abandoned by June 20.

Ferruginous Hawk. A pair was seen repeatedly calling overhead near the location of the 1977 active nest, but the nest was empty in 1978. It is believed the pair nested at another nearby site in 1978.

Table 2. Summary of Inventory Data for Reptiles and Amphibians seen in the Circle West Study Area, June 1976 - February, 1979. ^{1/}

Species	Habitats In Which Observed	Distribution	Major Food Sources	Classifi- cation	Evidence
<u>Amphibians</u>					
Tiger Salamander (<u>Ambystoma tigrinum</u>)	RD, AF	-, 2, -	Worms, slugs, insects	N	P
Great Plains Toad (<u>Bufo cognatus</u>)	SR, GR, SA	1, 2, -	Insects	N	S(1)
Woodhouse's Toad (<u>Bufo woodhousei</u>)	SC, GR, SR	1, 2, -	<i>Insects</i>	<i>N</i>	<i>V</i>
Leopard Frog (<u>Rana pipiens</u>)	SM, PG	1, 2, 3	Insects	N	S(1)
Boreal Chorus Frog (<u>Pseudacris triseriata</u>)	PG	1, 2, 3	Insects	N	S(1)
<u>Reptiles</u>					
Painted Turtle (<u>Chrysemys picta</u>)	PG, PM, SM, RD	1, 2, 3	Aquatic plants & invertebrates	N	V
Short-horned Lizard (<u>Phrynosoma douglassi</u>)	BA	1, -, -	Insects	N	V
Western Hognose Snake (<u>Heterodon nasicus</u>)	GR, <i>BA</i>	-, 2, -	Rodents, frogs, N young birds, insects		P
Racer (<u>Coluber constrictor</u>)	GR, <i>SC</i>	1, 2, -	Rodents, frogs, N young birds, insects		V
Gopher Snake (<u>Pituophis catenifer</u>)	SA, BA, AF	1, 2, 3	Rodents, rabbits, birds, eggs	N	P
Plains Garter Snake (<u>Thamnophis radix</u>)	SM, <i>GR</i>	1, 2, 3	Frogs, insects, N mice, earth- worms		V
Prairie Rattlesnake (<u>Crotalus viridis</u>)	GR, SG, <i>SS, SC</i>	1, 2, 3	Rodents, frogs, N birds		P

^{1/} See WBS for explanation of abbreviations. Changes made as a result of the monitoring study are shown in italics.

Table 3. Summary of inventory data for bird species observed in the Circle West study area, June 1976 - February 1979.
See WBS for explanation of abbreviations.

Species	Preferred Habitat	Distri- bution	Classi- fi- cation	Guil- d	Evi- dence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Common Loon</i> (<i>Gavia immer</i>)	PR	- , 2, -	N	4680	MC	V	-	-	-	-	T	-	-	-	-	-	-
<i>Horned Grebe</i> (<i>Podiceps auritus</i>)	PR	1, 2, -	N	2680	M	V	-	-	-	-	T	-	-	-	-	-	-
<i>Eared Grebe</i> (<i>Podiceps nigricollis</i>)	SW, PR	1, 2, 3	N	2682	S(NE)	P	-	-	-	-	T	T	-	-	-	S	-
<i>Western Grebe</i> (<i>Aechmophorus occidentalis</i>)	SW	- , 2, 3	BN	4680	M	V	-	-	-	-	-	T	-	-	-	T	-
<i>Pied-billed Grebe</i> (<i>Podilymbus podiceps</i>)	PR	1, 2, 3	N	2682	S(PJ)	V	-	-	-	-	T	T	-	-	-	-	-
<i>White Pelican</i> (<i>Pelecanus erythrorhynchos</i>)	SW	- , 2, 3	BN	4680	V	V	-	-	-	S	-	T	S	-	-	-	-
<i>Double-crested Cormorant</i> (<i>Phalacrocorax auritus</i>)	SW, PR	1, 2, 3	BN	4687	S(NV)	V	-	-	-	S	S	D	D	T	-	T	-
<i>Great Blue Heron</i> (<i>Ardea herodias</i>)	FW, SW, SH, PR, SM	1, 2, 3	N	4677	S(NV)	V	-	-	-	S	B ^{1/}	S	B	B	T	-	-
<i>American Bittern</i> (<i>Botaurus lentiginosus</i>)	SW, PR	1, - , -	N	2670	M	V	-	-	-	-	T	-	-	-	-	-	-
<i>Canada Goose</i> (<i>Branta canadensis</i>)	PR, FW, SW, SH, CU	1, 2, 3	M	3674	S(PJ)	V	-	-	B	B	B	S	S	B	X	S	-
<i>Mallard</i> (<i>Anas platyrhynchos</i>)	PR, FW, SG	1, 2, 3	M	3674	S(PJ)	V	-	-	B	B	B	S	S	S	X	S	-
<i>Gadwall</i> (<i>Anas strepera</i>)	PR, SG	1, 2, 3	M	3674	S(PJ)	V	-	-	-	S	T	S	S	S	S	S	-
<i>Pintail</i> (<i>Anas acuta</i>)	PR, FW	1, 2, 3	M	3674	S(PJ)	V	-	-	B	S	D	S	S	-	-	-	-
<i>Green-winged Teal</i> (<i>Anas crecca</i>)	PR	1, 2, 3	M	3674	S(PJ)	V	-	-	S	S	S	B	S	-	S	S	-
<i>Blue-winged Teal</i> (<i>Anas discors</i>)	PF, FW, SA	1, 2, 3	M	3674	S(PJ)	V	-	-	-	B	B	B	S	-	S	S	-
<i>American Wigeon</i> (<i>Anas americana</i>)	PR, FW, SH	1, 2, 3	M	3674	S(PJ)	V	-	-	S	B	B	D	T	-	S	S	-

Table 3 (continued)

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern Shoveler (<u>Anas clypeata</u>)	PR,FW,SM, SH	1, 2, 3	3674	M	S(PJ)	V	-	-	S	S	S	S	S	S	-	-	-	-
Redhead (<u>Aythya americana</u>)	PR	-, 2, 3	3682	M	S(PJ)	V	-	-	S	S	-	T	T	-	-	S	-	-
Ring-necked Duck (<u>Aythya collaris</u>)	PR	1, 2, -	3680	M	M	V	-	-	S	-	T	T	-	-	-	S	S	-
Canvasback (<u>Aythya valisineria</u>)	PR	1, 2, 3	3682	BM	S(PJ)	V	-	-	-	S	T	D	T	-	-	S	S	-
Lesser Scaup (<u>Aythya affinis</u>)	PR,SH	1, 2, 3	3684	M	S(RH)	V	-	-	S	S	S	T	T	-	-	-	-	-
Common Goldeneye (<u>Bucephala clangula</u>)	PR	-, 2, 3	3680	M	M	V	-	-	S	S	-	T	-	-	-	-	-	-
Bufflehead (<u>Bucephala albeola</u>)	PR,SW	-, 2, 3	3680	M	M	V	-	-	-	S	T	-	-	-	-	S	S	-
Ruddy Duck (<u>Oxyura jamaicensis</u>)	PR	-, 2, 3	3682	M	S(CD)	V	-	-	-	-	-	S	D	-	-	-	-	-
Common Merganser (<u>Mergus merganser</u>)	PR,SW	-, 2, 3	4680	M	M	V	-	-	S	S	-	-	-	-	-	T	-	-
Red-breasted Merganser (<u>Mergus serrator</u>)	PR	-, 2, -	4680	M	M	V	-	-	-	S	-	-	-	-	-	-	-	-
Turkey Vulture (<u>Cathartes aura</u>)	BA,SC	1, 2, 3	5233	N	S(AN)	V	-	-	-	-	T	S	S	S	-	-	-	-
Sharp-shinned Hawk (<u>Accipiter striatus</u>)	CF,CU,TL	-, -, 3	4267	BN	S(RH)	V	-	-	-	S	-	-	-	-	-	B	-	-
Red-tailed Hawk (<u>Buteo jamaicensis</u>)	Various	1, 2, 3	4267	N	S(PJ)	P	-	-	-	B	B	B	B	B	S	B	-	-
Swinson's Hawk (<u>Buteo swainsoni</u>)	GR,CU,SC, TL,FR,SG	1, 2, 3	4267	BN	S(AN)	V	T	-	-	B	B	S	B	B	S	B	-	-
Rough-legged Hawk (<u>Buteo lagopus</u>)	GR,CU,BA TL,SG,LB	1, 2, 3	4260	N	W	V	S	B	B	-	-	-	-	-	-	S	S	T
Ferruginous Hawk (<u>Buteo regalis</u>)	GR,BA,SC, FR,TL,HJ	1, 2, 3	4263	BNU	S(PJ)	P	-	-	-	-	T	B	S	S	-	-	S	B

Table 3 (continued)

Species	Preferred Habitat	Distribution	Guild	Classification	Evidenced	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Golden Eagle (<u>Aquila chrysaetos</u>)	Various	1, 2, 3	4263	N	R(PJ)	P	B	B	B	S	B	D	S	B	B	S	B
Bald Eagle (<u>Haliaeetus leucocephalus</u>)	CF,SH,CG	1, 2, 3	4660	E	W	V	T	X	-	-	-	S	-	-	-	S	S
Marsh Hawk (<u>Circus cyaneus</u>)	WM,SR,GR, SS,LC,SG	1, 2, 3	4264	BN	S(PJ)	V	-	-	S	B	B	B	B	B	B	S	-
Osprey (<u>Pandion haliaetus</u>)	SW,CG	- , -, 3	4687	BNU	S(NY)	V	-	-	-	S	S	-	-	-	-	-	-
Prairie Falcon (<u>Falco mexicanus</u>)	GR,BA,SC, CU,CG,SG	1, 2, 3	4263	BNT	R(NY)	P	-	S	S	S	B	B	B	S	B	-	-
Peregrine Falcon (<u>Falco peregrinus</u>)	CU,SG	1, 2, 3	4260	NE	M	V	-	S	-	-	S	-	-	-	-	-	S
Merlin (<u>Falco columbarius</u>)	CF,CU	- , -, 3	4260	BNU	M	V	-	B	-	-	T	-	-	B	-	-	-
American Kestrel (<u>Falco sparverius</u>)	GR,CU,SC, BA,CG,TL	1, 2, 3	2268	BN	S(PJ)	V	-	-	S	B	B	B	B	B	T	-	-
Sharp-tailed Grouse (<u>Pedioecetes phasianellus</u>)	see WBS	1, 2, 3	3234	BG	R(PJ)	S(P)	B	B	B	B	B	B	B	B	B	S	B
Sage Grouse (<u>Centrocercus urophasianus</u>)	SS,SG,BS, BG,SA,GR	1, 2, 3	1234	BG	R(PJ)	S(P)	T	-	-	S	B	B	B	B	T	-	-
Ring-necked Pheasant (<u>Phasianus colchicus</u>)	see WBS	1, 2, 3	1234	G	R(PJ)	S(P)	B	B	B	B	B	B	B	B	B	S	B
Gray Partridge (<u>Perdix perdix</u>)	CU,GR,LC, SG,SS,BX	1, 2, 3	1234	G	R(RH)	S(P)	S	B	-	B	B	B	B	B	B	S	B
Sandhill Crane (<u>Grus canadensis</u>)	CU,GR	- , 2, 3	3230	M	M	V	-	-	-	-	-	-	-	S	S	-	-
Sora (<u>Porzana carolina</u>)	CM,SM	1, -, 3	3672	M	S(TO)	V	-	-	-	T	B	-	-	-	-	-	-
American Coot (<u>Fulica americana</u>)	PR,SW,FW	1, 2, 3	3682	M	S(PJ)	V	-	-	-	S	T	T	-	-	T	-	-
Killdeer (<u>Charadrius vociferus</u>)	SH,GR,SA, CU,SM	1, 2, 3	2234	M	S(PJ)	V	-	-	B	B	B	B	B	-	B	-	-

Table 3 (continued)

Species	Preferred Habitat	Distribution	Guild	Classification	Evidence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Black-bellied Plover</i> (<i>Pluvialis squatarola</i>)	GR	1, -, -	2230	M	M	V	-	-	-	T	-	-	-	-	-	-	-
<i>Common Snipe</i> (<i>Capella gallinago</i>)	FW, WM, SM	-, 2, 3	2234	M	S(RH)	B	-	-	S	-	T	-	-	-	-	-	-
<i>Long-billed Curlew</i> (<i>Numenius americanus</i>)	GR	1, 2, 3	2234	MU	S(RH)	V	-	-	-	T	T	B	-	-	-	-	-
<i>Upland Sandpiper</i> (<i>Bartamia longicauda</i>)	GR, SA	1, 2, 3	2234	BM	S(TO)	V	-	-	S	B	B	B	-	-	-	-	-
<i>Spotted Sandpiper</i> (<i>Actitis macularia</i>)	FW, PR, SH	1, 2, 3	2294	M	S(RH)	V	-	-	-	T	T	D	S	-	-	-	-
<i>Solitary Sandpiper</i> (<i>Tringa solitaria</i>)	SH, PR	1, 2 -	2290	M	M	V	-	-	-	T	-	T	-	-	-	-	-
<i>Willet</i> (<i>Catoptrophorus semipalmatus</i>)	CU, WM	1, 2, 3	2294	M	S(RH)	V	-	-	B	T	T	T	-	-	-	-	-
<i>Greater Yellowlegs</i> (<i>Tringa melanoleuca</i>)	SH, PR	-, 2, -	2290	M	M	V	-	-	-	-	-	T	-	-	-	-	-
<i>Lesser Yellowlegs</i> (<i>Tringa flavipes</i>)	SH, PR	-, 2, 3	2290	M	M	V	-	-	S	T	T	T	-	-	-	-	-
<i>Baird's Sandpiper</i> (<i>Calidris bairdii</i>)	FW, SH	1, -, -	2290	M	M	V	-	-	-	T	-	-	-	-	-	-	-
<i>Least Sandpiper</i> (<i>Calidris minutilla</i>)	FW, SH	1, -, -	2290	M	M	V	-	-	-	T	-	-	-	-	-	-	-
<i>Long-billed Dowitcher</i> (<i>Limodromus scolopaceus</i>)	FW, SN	1, 2, -	2290	M	M	V	-	-	-	T	-	T	-	-	-	-	-
<i>Western Sandpiper</i> (<i>Calidris mauri</i>)	FW, SN	1, -, -	2290	M	M	V	-	-	-	T	-	-	-	-	-	-	-
<i>Sanderling</i> (<i>Calidris alba</i>)	PR	1, -, -	2290	M	M	V	-	-	-	-	-	S	-	-	-	-	-
<i>American Avocet</i> (<i>Recurvirostra americana</i>)	PR, GR	1, 2, 3	2294	M	S(RH)	V	-	-	-	S	T	-	T	-	-	-	-
<i>Wilson's Phalarope</i> (<i>Steganopus tricolor</i>)	FW, PR	1, 2, 3	2674	N	S(RH)	V	-	-	-	B	D	D	-	-	-	-	-

Table 3 (continued)

Species	Preferred Habitat	Distribution	Guild	Classification	Evid- ence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
California Gull (<i>Larus californicus</i>)	PR,FW,CU, SH	1, 2, 3	3230	N	V	-	-	-	S	-	S	S	-	-	T	-	-
Ring-billed Gull (<i>Larus delawarensis</i>)	PR,CU,GR, SH	1, 2, 3	3230	N	V	-	-	-	S	-	D	D	S	-	-	-	-
Common Tern (<i>Sterna hirundo</i>)	PR	1, -, -	2680	N	V	-	-	-	-	-	T	-	-	-	-	-	-
Black Tern (<i>Chlidonias niger</i>)	GR,PR	1, 2, 3	2682	N	S(R)	-	-	-	-	T	T	-	-	-	-	-	-
Rock Dove (<i>Columba livia</i>)	CU,GR,OF	-, -, 3	1233	N	R(P)	T	S	B	B	B	B	B	B	B	B	S	T
Mourning Dove (<i>Zenaida macroura</i>)	TC,CU,GR, LC,CG	1, 2, 3	1236	N	S(P)	-	-	-	B	B	B	B	B	S	T	-	-
Black-billed Cuckoo (<i>Coccyzus erythrophthalmus</i>)	SF,RS	-, -, 3	2336	N	S(R)	-	-	-	-	-	B	T	-	-	-	-	-
Great Horned Owl (<i>Bubo virginianus</i>)	FG,TC,CG BA	1, 2, 3	4267	N	R(T)	-	B	B	B	B	T	B	B	B	B	-	T
Snowy Owl (<i>Nyctea scandiaca</i>)	CU,GR	-, -, 3	4260	N	W	-	B	B	-	-	-	-	-	-	-	-	T
Burrowing Owl (<i>Speotyto cunicularia</i>)	GR,SG	1, 2, 3	2269	BNU	S(P)	-	-	-	S	B	B	B	B	S	-	-	-
Long-eared Owl (<i>Asio otus</i>)	CG	-, -, 3	4267	N	S(R)	-	-	-	-	-	S	-	-	-	-	-	-
Short-eared Owl (<i>Asio flammeus</i>)	WM,SG,GR CU,SR	1, 2, 3	4264	BN	R(T)	S	-	-	B	T	-	S	B	S	-	-	-
Common Nighthawk (<i>Chordeiles minor</i>)	CG,GR,SS	1, 2, 3	2504	N	S(W)	-	-	-	-	S	B	B	B	S	-	-	-
Belted Kingfisher (<i>Megasceryle alcyon</i>)	SM,FW	-, -, 3	4683	N	S(R)	-	-	-	-	B	-	-	-	-	-	-	-
Common Flicker (<i>Colaptes auratus</i>)	CF,CG,FG, SG,GR	1, 2, 3	2238	N	S(R)	-	-	-	B	B	B	B	B	B	-	-	-
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	CF,CG,GR	-, 2, 3	2118	BN	S(R)	-	-	-	-	D	S	B	B	-	-	-	-

Table 3 (continued)

Species	Preferred Habitat	Distribution	Classification	Guild	Status	Evidence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hairy Woodpecker (<u>Dendrocopos villosus</u>)	FG	- , 2, 3	BN	2118	R(SS)	V	-	S	-	-	-	T	-	-	-	-	-	-
Eastern Kingbird (<u>Tyrannus tyrannus</u>)	TC,LC,SG, GR,SR	1, 2, 3	N	2556	S(PJ)	V	-	-	-	-	B	B	B	B	-	-	-	-
Western Kingbird (<u>Tyrannus verticalis</u>)	TC,CG,FG, LC,GR	1, 2, 3	N	2557	S(NY)	V	-	-	-	-	B	B	B	B	-	-	-	-
Say's Phoebe (<u>Sayornis saya</u>)	BA,GR	1, 2, 3	N	2553	S(NY)	V	-	-	-	B	B	B	B	S	-	-	-	-
Least Flycatcher (<u>Empidonax minimus</u>)	FG,CF,TC	- , 2, 3	N	2556	S(RH)	V	-	-	-	-	B	B	T	-	-	-	-	-
<u>Empidonax flycatcher</u> (<u>Empidonax</u> spp.)	SG,TC	1, 2, -	N	2550	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Western Wood Pewee (<u>Contopus sordidulus</u>)	BX	- , - , 3	N	2557	S(RH)	A	-	-	-	-	-	B	-	-	-	-	-	-
Horned Lark (<u>Eremophila alpestris</u>)	GR,CU,SG	1, 2, 3	N	3234	R(NY)	S(2)	B	B	B	B	B	B	B	B	B	S	B	B
<u>Tree Swallow</u> (<u>Iridoprocne bicolor</u>)	FW,CF	- , - , 3	N	2508	S(RH)	V	-	-	-	-	-	T	-	-	-	-	-	-
Bank Swallow (<u>Riparia riparia</u>)	GR,SA,SM	- , 2, 3	N	2503	S(AN)	V	-	-	-	-	-	B	S	S	-	-	-	-
Rough-winged Swallow (<u>Stelgidopteryx ruficollis</u>)	GR,SA,SM	- , 2, 3	N	2503	S(RH)	V	-	-	-	-	B	B	B	B	-	-	-	-
Barn Swallow (<u>Hirundo rustica</u>)	AF,OF,GR	1, 2, 3	N	2503	S(NY)	V	-	-	-	-	B	B	B	B	-	-	-	-
Cliff Swallow (<u>Petrochelidon pyrrhonota</u>)	GR,SA,AF	1, 2, 3	N	2503	S(NY)	V	-	-	-	-	B	B	B	B	-	-	-	-
Black-billed Magpie (<u>Pica pica</u>)	CF,TC,LC, CG,FG,GR	1, 2, 3	N	3236	R(PJ)	V	B	B	B	B	B	B	B	B	B	S	B	B
Common Crow (<u>Corvus brachyrhynchos</u>)	CF,GR,CU	1, 2, 3	N	3237	S(RH)	V	-	-	S	B	B	B	B	B	B	T	-	-
Black-capped Chickadee (<u>Parus atricapillus</u>)	CF,TC,RS, FG	- , 2, 3	N	2348	R(TO)	V	T	B	B	-	T	T	B	-	B	B	S	B
Red-breasted Nuthatch (<u>Sitta canadensis</u>)	FG	- , - , 3	N	2120	M	V	-	-	-	-	-	-	-	-	S	-	-	-
House Wren (<u>Troglodytes aedon</u>)	CF,FG	- , - , 3	N	2338	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-	-

Table 3 (continued)

Species	Preferred Habitat	Ois- tri- bution	Class- ifi- cation	Guil- d	Evi- dence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rock Wren (<u>Salpinctes obsoletus</u>)	BA,SC	1, 2, 3	N	2233	S(TO) V	-	-	-	B	B	B	B	B	B	-	-	-
Gray Catbird (<u>Dumetella carolinensis</u>)	CF,RS	-, -, 3	N	2336	S(RH) V	-	-	-	-	S	T	B	-	-	-	-	-
Brown Thrasher (<u>Toxostoma rufum</u>)	LC,TC,GR	1, 2, 3	N	2335	S(PJ) V	-	-	-	-	B	B	B	B	-	-	-	-
Sage Thrasher (<u>Oreoscoptes montanus</u>)	BS,BA	-, -, 3	N	2335	S(TO) A	-	-	-	-	T	T	B	-	-	-	-	-
American Robin (<u>Turdus migratorius</u>)	FG,LC,GR	1, 2, 3	N	3237	R(RH) V	B	-	-	B	B	B	B	B	B	B	-	-
Swainson's Thrush (<u>Catharus ustulatus</u>)	BX	1, 2, 3	N	2330	M A	-	-	-	-	S	-	-	-	-	-	-	-
Mountain Bluebird (<u>Sialia currocooides</u>)	GR,BA	1, 2, 3	N	2338	S(TO) V	-	-	-	-	T	B	B	B	X	-	-	-
Townsend's Solitaire (<u>Myadestes townsendi</u>)	FG	-, -, 3	N	3330	W A	-	-	-	-	-	-	-	-	-	-	-	B
Golden-crowned Kinglet (<u>Regulus satrapa</u>)	TC	-, 2, 3	N	3330	M V	-	-	-	-	-	-	-	-	-	T	-	-
Water Pipit (<u>Motacilla spinoletta</u>)	SH	-, 2, 3	N	2290	M V	-	-	-	S	-	-	-	-	-	-	-	-
Sprague's Pipit (<u>Anthus spragueii</u>)	SG,SG	1, 2, 3	N	2234	S(TO) V	-	-	-	B	B	B	B	S	-	-	-	-
Bohemian Waxwing (<u>Bombycilla garrulus</u>)	CF,RS,CU	-, -, 3	N	1440	W V	B	B	B	-	-	-	-	-	-	-	S	B
Cedar Waxwing (<u>Bombycilla cedrorum</u>)	CF,RS,FG	-, -, 3	N	3447	S(RH) V	-	-	-	-	-	-	T	-	B	-	-	-
Northern Shrike (<u>Lanius excubitor</u>)	TC,GR,SG	-, 2, 3	N	4260	W S(1)	B	B	-	-	-	-	-	-	-	B	S	B
Loggerhead Shrike (<u>Lanius ludovicianus</u>)	TC,LC,GR, SG	1, 2, 3	BN	4266	S(PJ) S(1)	-	-	-	B	B	B	B	B	-	-	-	-
Starling (<u>Sturnus vulgaris</u>)	OF,AF,FG, CG	-, 2, 3	N	3233	R(NY) V	T	-	B	B	B	B	B	B	B	B	S	B
Red-eyed Vireo (<u>Vireo olivaceus</u>)	CP	-, -, 3	N	2447	S(RM) A	-	-	-	-	-	-	T	-	-	-	-	-
Warbling Vireo (<u>Vireo gilvus</u>)	CG,FG,CF	-, 2, 3	BN	2447	S(TO) V	-	-	-	-	S	B	B	-	-	-	-	-

Table 3 (continued)

Species	Preferred Habitat	Distri- bution	Class- ifi- cation	Status	Evi- dence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Tennessee Warbler</i> (<i>Vermivora peregrina</i>)	BX, FG	-, -, 3	2440	N	M	S(1)	-	-	-	-	T	-	-	-	-	-	-
Orange-crowned Warbler (<i>Vermivora celata</i>)	BX	-, -, 3	2440	N	M	V	-	-	-	B	-	-	-	-	-	-	-
Yellow Warbler (<i>Dendroica petechia</i>)	LC, TC, SR, FG, CF, CG	1, 2, 3	2336	BN	S(TO)	V	-	-	-	B	B	B	-	-	-	-	-
<i>Magnolia Warbler</i> (<i>Dendroica magnolia</i>)	FG	-, -, 3	2330	N	M	V	-	-	-	-	T	-	-	-	-	-	-
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	TC, LC, SR, SS	-, 2, 3	3230	N	M	V	-	-	-	B	T	-	-	B	T	-	-
Common Yellowthroat (<i>Geothlypis trichas</i>)	SR, SS, LC	1, 2, 3	2334	N	S(AF)	V	-	-	-	-	B	B	B	S	-	-	-
Yellow-breasted Chat (<i>Icteria virens</i>)	TC	-, 2, 3	2336	BN	S(TO)	V	-	-	-	-	T	S	S	B	-	-	-
Wilson's Warbler (<i>Wilsonia pusilla</i>)	RS, TC	-, 2, 3	3230	N	M	V	-	-	-	-	-	-	-	B	T	-	-
House Sparrow (<i>Passer domesticus</i>)	OF, AF, FG	1, 2, 3	3233	N	R(PJ)	V	B	B	B	B	B	B	B	B	B	S	B
Boblink (<i>Dolichonyx oryzivorus</i>)	CU	1, 2, 3	3234	N	S(AF)	V	-	-	-	B	T	T	-	-	-	S	-
Western Meadowlark (<i>Sturnella neglecta</i>)	GR, SS, SG, CU, LC, SR	1, 2, 3	2234	N	S(NY)	V	-	-	-	B	B	B	B	B	B	-	-
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	SM, GR	1, 2, 3	2231	N	S(TO)	V	-	-	-	S	B	B	B	S	-	-	-
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	CM, SM, GR	1, 2, 3	2231	N	R(NY)	V	-	B	-	B	B	B	S	B	B	-	-
Orchard Oriole (<i>Icterus spurius</i>)	BX, CF	-, -, 3	2447	N	S(TO)	V	-	-	-	-	B	-	-	-	-	-	-

Table 3 (continued)

Species	Preferred Habitat	Distribution	Class- ification	Guild	Status	Evidence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern Oriole (<u>Icterus galbula</u>)	CF,CG,BX, SS	1, 2, 3	2447 N	S(TO)	V		-	-	-	-	B	B	B	-	-	-	-	-
Brewer's Blackbird (<u>Euphaga cyanocephalus</u>)	GR,CU,BA	1, 2, 3	2234 N	S(PJ)	S(1)		-	-	-	B	B	B	B	B	-	B	-	-
Common Grackle (<u>Quiscalus quiscula</u>)	GR,CG	1, 2, 3	2236 N	S(RH)	V		-	-	-	B	B	B	S	-	-	-	-	-
Brown-headed Cowbird (<u>Molothrus ater</u>)	GR,LC,TC	1, 2, 3	223 N	S(NE)	V		-	-	-	-	B	B	B	-	-	-	S	-
Rose-breasted Grosbeak (<u>Pheucticus ludovicianus</u>)	LC,TC	- , 2, -	3330 N	M	V		-	-	-	-	-	-	-	-	-	T	-	-
Black-headed Grosbeak (<u>Pheucticus melanocephalus</u>)	TC	- , 2, -	3330 N	V	V		-	-	-	-	T	-	-	-	-	-	-	-
Lazuli Bunting (<u>Passerina amoena</u>)	RS,CU	- , - , 3	3236 N	S(TO)	V		-	-	-	-	B	B	B	-	-	-	-	-
Grey-crowned Rosy Finch (<u>Leucosticte tephrocotis</u>)	LC	1, - , -	1230 N	M	V		-	-	-	-	-	-	S	-	-	-	-	-
Common Redpoll (<u>Acanthis flammea</u>)	CU,GR,TC	1, 2, 3	1230 N	W	V		B	B	B	-	-	-	-	-	-	B	S	B
American Goldfinch (<u>Spinus tristis</u>)	FG,TC,RS, CG,LC,GR	1, 2, 3	1236 N	S(RH)	V		-	-	-	-	B	B	B	B	B	-	-	-
Rufous-sided Towhee (<u>Pipilo erythrophthalmus</u>)	TC,LC	1, 2, 3	3235 N	S(PJ)	V		-	-	-	-	B	B	B	B	B	-	-	-
Lark Bunting (<u>Calamospiza melanocorys</u>)	SS,SG,GR	1, 2, 3	3234 N	S(PJ)	V		-	-	S	-	B	B	B	B	-	-	S	-
Savannah Sparrow (<u>Passerculus sandwichensis</u>)	GR,SS,WM	1, 2, 3	3234 N	S(TO)	V		-	-	-	-	B	B	B	-	B	-	-	-
Grasshopper Sparrow (<u>Ammodramus savannarum</u>)	SG,GR	1, 2, 3	3234 BN	S(TO)	V		-	-	-	-	B	B	B	-	-	-	-	-
Baird's Sparrow (<u>Ammodramus bairdii</u>)	GR,SA	1, 2, 3	3234 N	S(TO)	V		-	-	-	-	T	T	T	-	-	-	-	-
Vesper Sparrow (<u>Poocetes gramineus</u>)	SS,SG,GR BS,BG	1, 2, 3	3234 BN	S(TO)	S(1)		-	-	-	B	B	B	B	B	B	-	-	-
Lark Sparrow (<u>Chondestes grammacus</u>)	GR,BA,SG	1, 2, 3	3234 N	S(PJ)	V		-	-	-	-	B	B	B	B	-	-	-	-
Dark-eyed Junco (<u>Junco hyemalis</u>)	TC,SG,BA	1, 2, 3	3230 N	M	V		-	-	-	-	-	-	-	-	B	T	-	-

Table 3 (continued)

Species	Preferred Habitat	Distribution	Classification	Evidence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tree Sparrow (<u>Spizella arborea</u>)	TC,RS,SR, WI	1, 2, 3	1230 N	W	V	-	-	B	-	-	-	-	-	B	-	-
Chipping Sparrow (<u>Spizella passerina</u>)	SS,SG,TC, RS	1, 2, 3	3236 N	S(RH)	V	-	-	-	B	T	B	B	B	-	-	-
Clay-colored Sparrow (<u>Spizella pallida</u>)	SR,RS	1, 2, 3	3234 N	S(TO)	V	-	-	-	B	B	B	-	-	-	-	-
Brewer's Sparrow (<u>Spizella breweri</u>)	SS,SG,BS, BG	1, 2, 3	2235 N	S(NV)	V	-	-	-	B	B	B	B	S	-	-	-
Field Sparrow (<u>Spizella pusilla</u>)	GR,SG	-, -, 3	3234 N	S(TO)	V	-	-	-	B	B	B	B	-	-	-	-
Hamis' Sparrow (<u>Zonotrichia querula</u>)	FG	-, -, 3	3230 N	M	V	-	-	-	-	T	-	-	-	-	-	-
White-crowned Sparrow (<u>Zonotrichia leucophrys</u>)	TC,RS,CF, FG	-, -, 3	1230 N	M	V	-	-	-	B	B	-	-	B	-	-	-
Song Sparrow (<u>Melospiza melodia</u>)	CF,CG,RS FG	-, -, 3	3334 N	S(RH)	V	-	-	-	S	T	T	-	B	-	-	-
McCown's Longspur (<u>Calcarius mccownii</u>)	GR	-, -, 3	3234 N	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-
Lapland Longspur (<u>Calcarius lapponicus</u>)	CU,GR	-, 2, 3	1230 N	W	V	B	B	-	-	-	-	-	-	-	S	S
Chestnut-collared Longspur (<u>Calcarius ornatus</u>)	GR,CU	1, 2, 3	3234 N	S(NE)	S(1)	-	-	-	B	B	B	B	B	-	-	-
Snow Bunting (<u>Plectrophenax nivalis</u>)	CU,GR	-, 2, 3	1230 N	W	V	B	B	-	-	-	-	-	-	B	S	S

1/ B=recorded on one or more of four standard roadside routes during baseline study. Other abbreviations as in the WBS.

Table 4. Summary of inventory data for mammal species observed in the Circle West study area, June 1976 - February 1979.
(See WBS for explanation of abbreviations.)

Species	Preferred Habitat	Distribution	Major Food Sources	Classification	Evidence	Monthly Occurrence and Sample Abundance											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Merriam's Shrew (<u>Sorex merriami</u>)	HJ	1, -, -	Invertebrates	N	S(1)	-	-	-	-	-	-	-	-	-	S	-	-
Desert Cottontail (<u>Sylvilagus auduboni</u>)	LC,TC,SS, SG,AF	1, 2, 3	Grasses, seeds, leaves, fruit	N	S(3)	B ^{1/}	B	-	B	B	B	B	B	B	B	S	B
White-tailed Jackrabbit (<u>Lepus townsendi</u>)	GR,SS,SG	1, 2, 3	Grasses, forbs, buds, twigs	N	P	X	B	-	B	B	B	S	S	B	S	S	S
Least Chipmunk (<u>Eutamias minimus</u>)	TC,LC,BA	1, 2, 3	Plants, seeds, fruits, insects	N	S(1)	-	-	-	-	T	S	S	S	S	S	-	-
13-lined Ground Squirrel (<u>Spermophilus tridecemlineatus</u>)	GR	1, 2, 3	Grass, seeds, insects	N	V	-	-	-	X	B	S	S	S	S	S	-	-
Black-tailed Prairie Dog (<u>Cynomys ludovicianus</u>)	GR	-, 2, 3	Grasses, insects	N	S(2)	-	-	S	S	S	S	B	S	B	S	S	-
Northern Pocket Gopher (<u>Thomomys talpoides</u>)	GR,WM	1, 2, 3	Roots, grasses	N	S(1)	-	-	-	-	-	-	-	-	-	-	-	-
Wyoming Pocket Mouse (<u>Perognathus fasciatus</u>)	GR,SS	1, 2, 3	Seeds, grass	N	V	-	-	-	-	-	-	-	-	-	-	-	-
Beaver (<u>Castor canadensis</u>)	FW	1, 2, 3	Bark and twigs, green plants	F	R	-	-	-	-	T	-	-	-	-	-	-	-
Western Harvest Mouse (<u>Reithrodontomys megalotis</u>)	SC,GR,LC	1, 2, 3	Seeds, grass	N	S(2)	-	-	-	-	-	-	-	-	-	-	-	-
Deer Mouse (<u>Peromyscus maniculatus</u>)	Various	1, 2, 3	Seeds, grass insects, fruit	N	S(12)	-	-	-	S	-	S	S	S	S	S	-	-
Prairie Vole (<u>Microtus ochrogaster</u>)	SR	-, 2, -	Grasses, seeds, insects	N	S(6)	-	-	-	-	-	-	-	-	-	-	-	-
Meadow Vole (<u>Microtus pennsylvanicus</u>)	SM	-, 2, -	Grasses, seeds, insects	N	S(1)	-	-	-	-	-	-	-	-	-	-	-	-
Long-tailed Vole (<u>Microtus longicaudus</u>)	TC	-, 2, -	Grasses, seeds, insects	N	S(1)	-	-	-	-	-	-	-	-	-	-	-	-
Muskrat (<u>Onatra zibethicus</u>)	FW,SA	1, 2, 3	Aquatic plants and animals	F	V	-	-	S	S	S	B	S	S	S	S	S	-
Porcupine (<u>Erethizon dorsatum</u>)	CG,CF,TC, LC	1, 2, 3	Bark, buds, twigs, forbs	N	S(1)	T	S	S	-	T	S	B	S	S	S	S	S
Coyote (<u>Canis latrans</u>)	Various	1, 2, 3	Mice, rabbits, carrion, insects	P	S(1)	T	T	S	B	B	S	B	S	B	S	S	S

Table 4 (continued)

Species	Preferred Habitat	Distribution	Major Food Sources	Classification	Evidence	Monthly Occurrence and Sample Abundance											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Red Fox (<i>Vulpes fulva</i>)	Various	1, 2, 3	Mice, rabbits, insects, fruit	N	V	T	B	S	-	-	S	S	B	B	B	S	B
Raccoon (<i>Procyon lotor</i>)	CF, BX, CU	- , 2, 3	Various	N	V	T	-	-	S	B	S	S	S	S	T	-	-
Long-tailed Weasel (<i>Mustela frenata</i>)	RD	- , 2, 3	Small rodents, birds	P	P	-	-	X	-	-	-	T	-	-	-	-	-
Mink (<i>Mustela vison</i>)	FW	- , 2, 3	Fish, small mammals, birds	F	R	-	-	-	-	-	-	-	-	-	-	R	-
Badger (<i>Taxidea taxus</i>)	GR	1, 2, 3	Rodents, rabbits	N	V	-	-	-	S	-	-	S	-	S	-	-	-
Striped Skunk (<i>Mephitis mephitis</i>)	Various	1, 2, 3	Insects, fruit eggs, carion	P	V	-	-	S	S	X	B	S	B	S	S	-	T
Bobcat (<i>Lynx rufus</i>)	BA	1, 2, -	Rabbits, rodents, birds	F	V	-	-	-	-	-	-	-	S	-	-	-	-
Mule Deer (<i>Odocoileus hemionus</i>)	See Text*	1, 2, 3 See text	See text	G	V	B	B	B	S	B	B	B	B	B	B	S	B
White-tailed Deer (<i>Odocoileus virginianus</i>)	See Text*	1, 2, 3 See text	See text	G	V	S	B	B	B	B	B	B	B	B	B	S	B
Pronghorn Antelope (<i>Antilocapra americana</i>)	See Text*	1, 2, 3 See text	See text	G	V	B	B	B	B	B	B	B	B	B	B	S	B

1/ B=Seen on one or more of four standard roadside counts during baseline study.(1977). Changes made as a result of the monitoring study are shown in italics.

Table 5. Summary of cumulative numbers of species observed in the Circle West study areas.

	Baseline Study (through February 28, 1978)			Through First Monitoring Period (March 7, 1979)		
	PMA	MSA	REC ^{1/}	PMA	MSA	REC
<u>AMPHIBIANS</u>						
Total number of Species	2	4	4	4	5	5
<u>REPTILES</u>						
Total number of Species	6	7	7	6	7	7
<u>BIRDS</u>						
Total number of species(T)	79	109	139	101	132	160
Summer Residents(S)	56	68	85	66	75	92
Permanent Residents (R)	12	16	17	13	16	17
Non-breeding Summer Vis.(V)	2	2	3	3	5	5
Migrants(M)	5	16	24	15	29	36
Winter Residents(W)	4	7	10	4	7	10
Total Breeding Species(S&R)	68	84	102	79	91	109
<u>MAMMALS</u>						
Total number of Species	19	26	26	20	27	27
TOTAL VERTEBRATE SPECIES	106	146	176	131	171	199

^{1/} PMA=Proposed Mining Area; MSA=Mine Study Area (including PMA); REC=Reconnaissance Study Area (including MSA)

Golden Eagle. The nest located on the proposed mining area in 1977 fledged two young in 1978.

Marsh Hawk. The nest located on the silver sagebrush breeding census plot fledged 6 young in 1978. Although territorial pairs were observed elsewhere on the mine study area, no additional nests were discovered.

Prairie Falcon. Adults were seen in 1978 near the 1977 nest site and elsewhere on the mine study area, but the nest site itself was not visited.

Peregrine Falcon. A possible but unverified sighting was made May 18, 1978 near the cottonwood grove in the southern quarter of the proposed mining area.

Sharp-Tailed Grouse. Attendance at grounds Nos. 6 and 7 (WBS) was 10 and 5, respectively, on April 20, 1978. Eight additional birds were seen at a possible lek roughly 0.8 km (0.5 mi) northeast of lek No. 6 on this same date.

Sage Grouse. No sage grouse were observed in the mine study area in 1978, and no indications of breeding were noted, although lek No. 4 (WBS) was not visited.

Ring-Necked Pheasant. A nest with 17 eggs was discovered on the silver buffaloberry - silver sagebrush breeding bird census grid on the proposed mining area. General observation indicated that populations had declined markedly from 1977, probably due to the severe winter weather and to heavy snowfall during the winter of 1977-78. This observation was supported by roadside survey data, which indicated a significant ($p < .01$) decline from 1977.

Great Horned Owl. A nest with three young was discovered in a silver buffaloberry shrub in the proposed mining area near the eastern boundary. Another nest with two young was found along the Prairie Elk Route at the Flying V Creek crossing; the same nest had been used by a red-tailed hawk pair in 1977.

Burrowing Owl. At least six active nests were found in the reconnaissance area; however, none were found in the mine study area.

Desert Cottontail. Results of the 1978 lagomorph survey are presented in Table 6 ; the number of cottontails observed does not differ significantly from the 1977 data ($p > .50$).

White-Tailed Jackrabbit. Results of the 1978 lagomorph survey are presented in Table 6 ; the number of jackrabbits observed was significantly lower (t-test, $p < .05$) in 1978 than in 1977.

Black-Tailed Prairie Dog. The large prairie dog town within the mine study area (WBS Figure 25) was completely poisoned out with strichnine-baited grain during the report period.

Mule Deer. A summary of data collected on mule deer observed during the study period is presented in Table 7. Fall production ratios of 96.8 fawns/100 females and 66.7 fawns/100 adults were obtained in 1978; this is comparable to 1977 data and is rated as "good" by MDFWP standards.

Aerial census data are presented in Table 8. It should be emphasized that the low number of deer seen during summer reflect decreased observability, and do not necessarily indicate a corresponding decrease in actual abundance. Based on these data, it can be assumed that at some time during the study period the mine study area supported at least 0.7 deer/km² (1.9/mi²) (spring 1978) and the proposed mining area supported at least 0.7 deer/km² (1.8 mi²) (winter 1978-79).

Distribution in the mine study area was generally similar to that observed in 1977-78; use of both the mine study area and proposed mining area was heaviest in winter and spring, and coulees and badlands in the northwest and southwest portions of the mine study area received the heaviest use at all seasons (Figures 1-4).

White-Tailed Deer. Only seventeen observations of white-tailed deer were recorded during the report period (Table 9). In the mine study area, white-tailed deer were seen only near the silver sagebrush breeding bird census plot in the southern portion of the proposed mining area.

Pronghorn. A summary of data collected on pronghorn observed during the study period is presented in Table 10. Summer-Fall production ratios range from 63.8 - 80.6 fawns/100 females and 42.5 - 49.7 fawns/100 adults. This is somewhat lower than 1977 production estimates.

Aerial census data are presented in Table 8; it can be seen that pronghorn do not use the study areas in winter, as was the case in 1977. Based on these data, it can be assumed that at some time during the study period, the mine study area supported at least 0.8 pronghorn/km² (2.0/mi²) (fall 1978), and that the proposed mining area supported at least 1.0 pronghorn/km² (2.6/mi²) (fall 1978).

Table 6. Results of 1978 lagomorph survey.

Date	Desert Cottontail		White-tailed Jackrabbit	
	Control Route	Experimental Route	Control Route	Experimental Route
October 6, 1978	3	0	4	1
October 7, 1978	1	1	1	2
October 8, 1978	1	0	7	2
Mean	1.6	0.3	4.0	1.6

Table 7. Classification summary for mule deer observed in the Circle West area, March 1978 - March 1979.

Period	All Groups			Total No. Observed	Fully classified groups only								Males/ Females
	Number of Groups	Group Size Average	Group Size Range		Total No. Classified	Total Adults	Adult Males	Adult Females	Young	Young/ 100 Adults	Young/ 100 Females		
Spring 1978	66	7	1-34	444	20	19 ^{1/}	2	17	1	-	-	-	
Summer 1978	40	2	1-5	66	58	52	17	35	6	-	-	-	
Fall 1978	37	2	1-9	90	75	45	14	31	30	66.7	96.8	0.45	
Winter 1978-79 ^{2/}	70	7	1-32	486	0	-	-	-	-	-	-	-	

^{1/} Percentage of total number classified in parentheses

^{2/} Including March 7, 1979 observations

Table 8. Deer and antelope aerial census data, Circle West area, March 1978-March 1979.

Date	Observer	Mine Study Area ^{1/}			Proposed Mining Area		
		Pronghorn	Mule Deer	White-tailed Deer	Pronghorn	Mule Deer	White-tailed Deer
3-2-78	Blanchard	-	186	-	-	-	-
4-19-78	Martin	196	140	-	13	13	-
5-21-78	Martin	248	67	3	15	4	-
6-12-78 ^{2/}	Martin	42 ^{2/}	7 ^{2/}	-	5 ^{2/}	-	-
7-13-78	Martin	72	4	-	-	-	-
8-19-78	Martin	141	18	-	14	-	-
9-17-78	DeSimone	169	45	-	30	3	-
10-30-78	DeSimone	194	45	-	3	-	-
1-10-79 ^{3/}	Stoneberg	-	74	-	-	6	-
1-23-79	Stoneberg	-	133	-	-	8	-
2-9-79	Stoneberg	3	151	-	-	19	-
3-7-79	Stoneberg	-	112	-	-	21	-

^{1/} Including proposed mining area

^{2/} Incomplete due to tape recorder malfunction

^{3/} Area flown at faster speed than desired

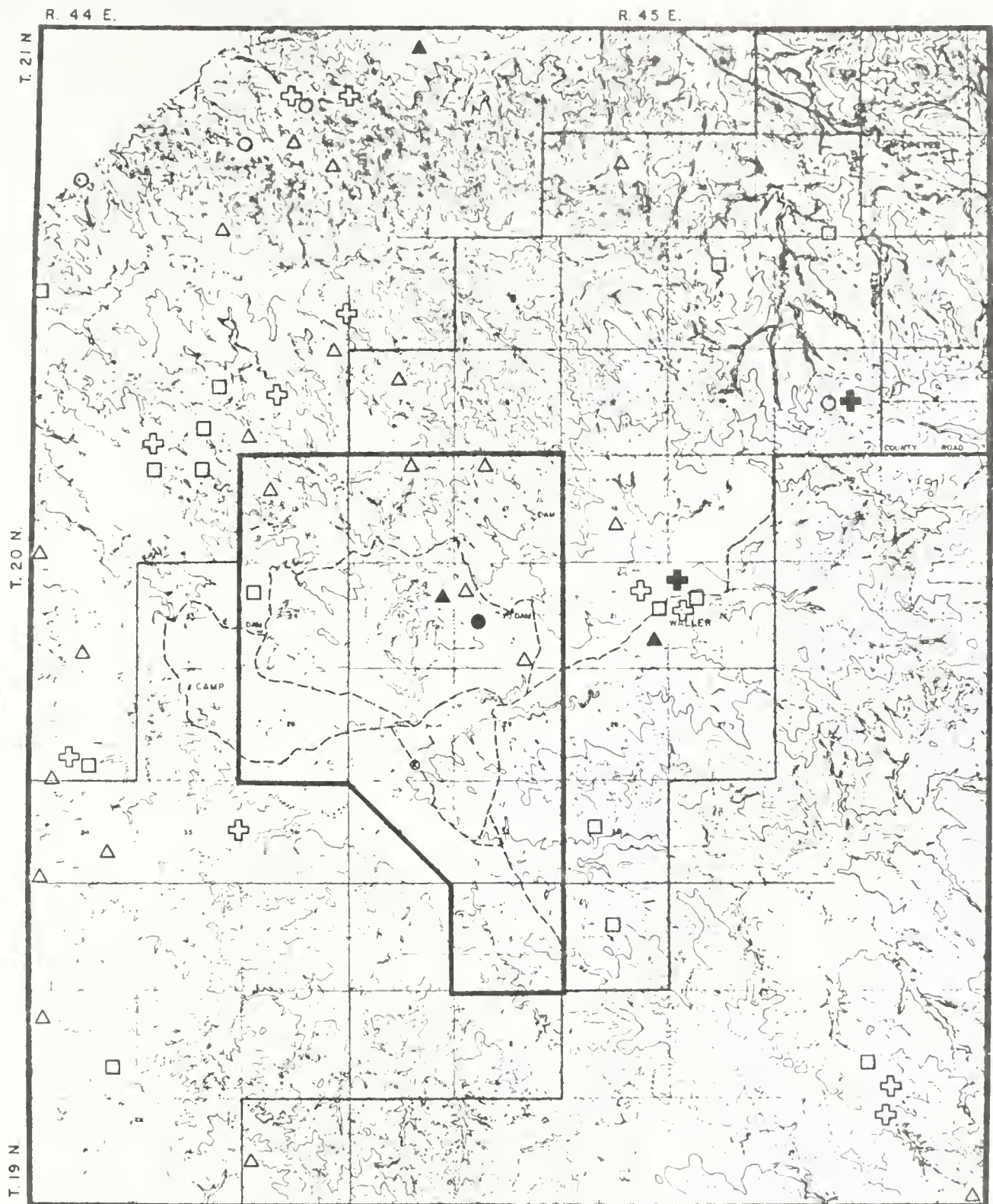


FIGURE 1. MULE DEER OBSERVATIONS, SPRING 1978

AERIAL			
○, 1	△, 2-5	□, 6-10	✚, >10
GROUND			
●, 1	▲, 2-5	■, 6-10	✚, >10

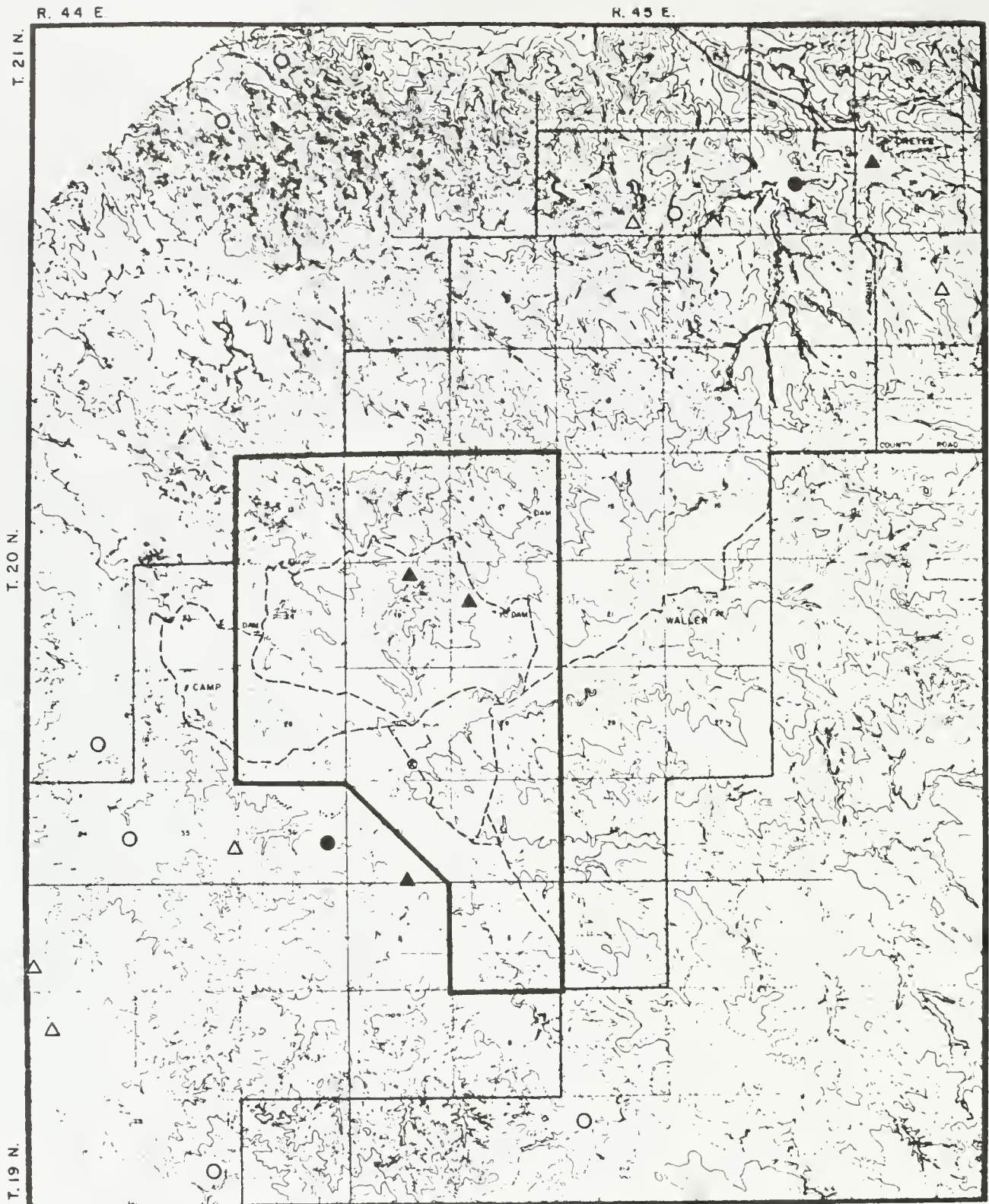
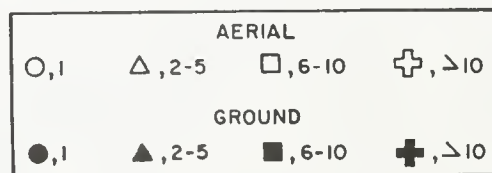


FIGURE 2. MULE DEER OBSERVATIONS, SUMMER 1978



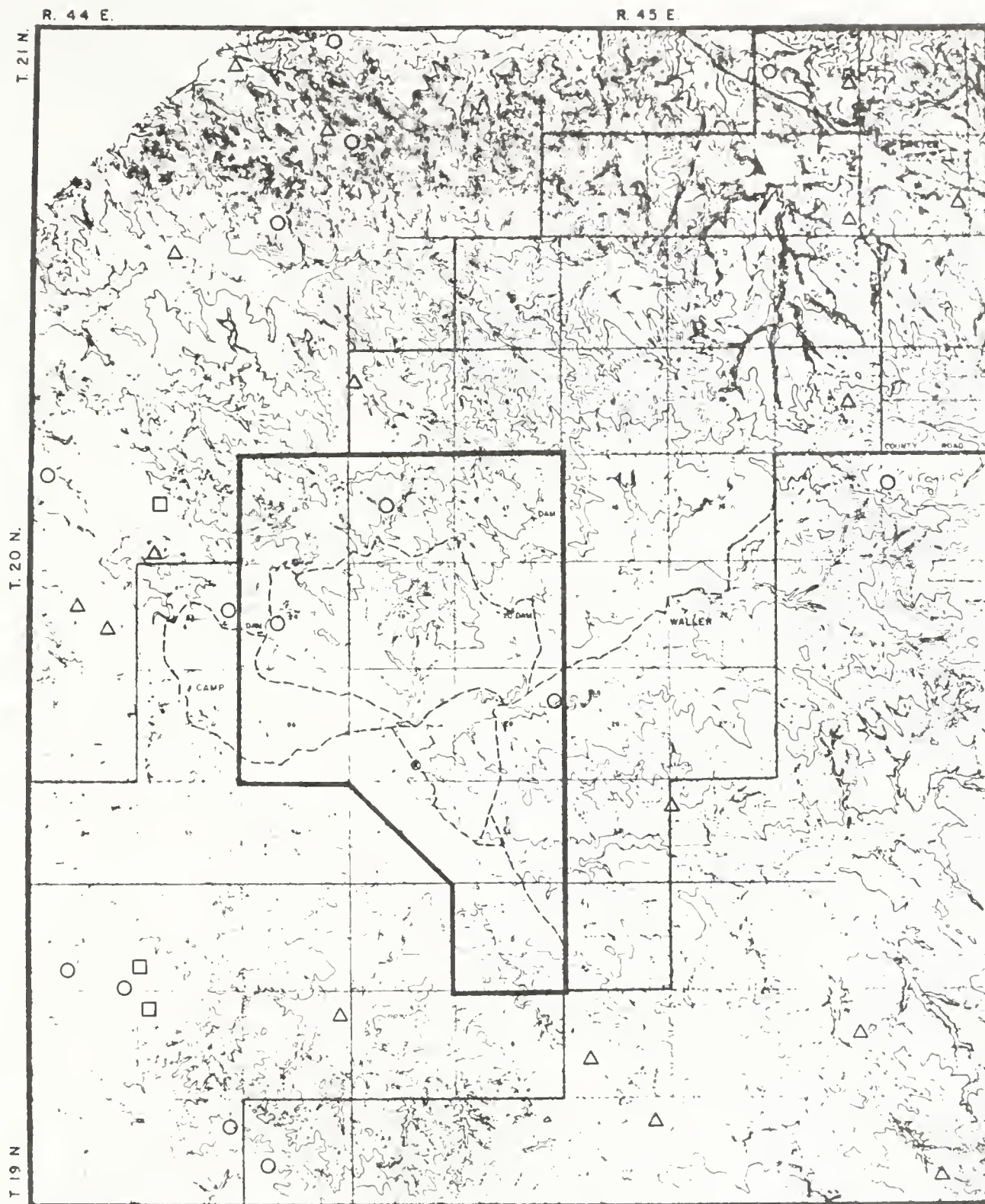
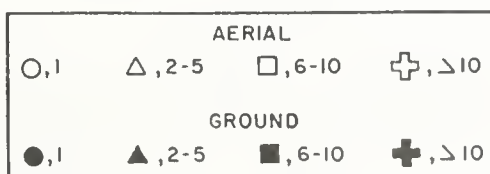


FIGURE 3. MULE DEER OBSERVATIONS, FALL 1978



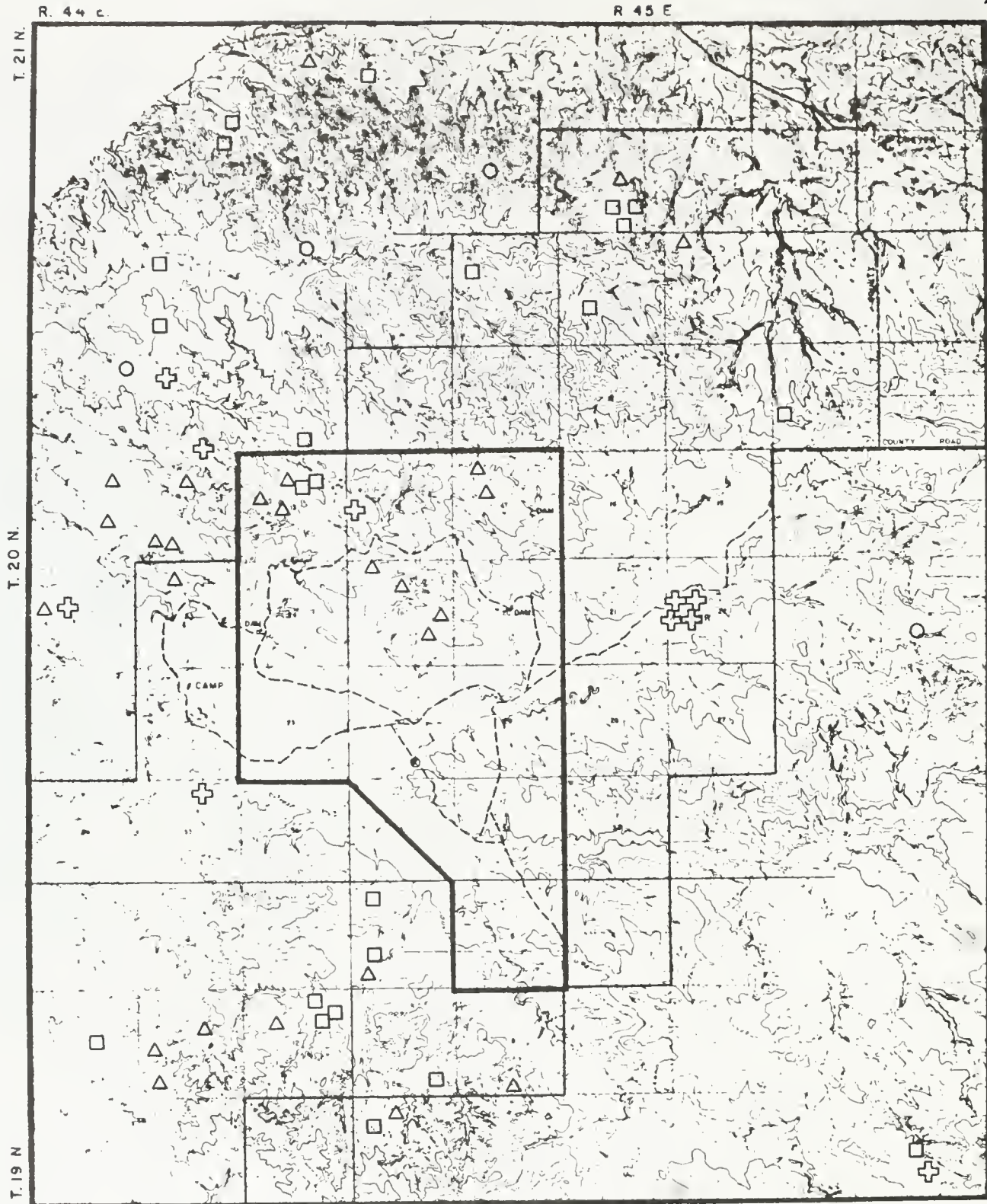


FIGURE 4. MULE DEER OBSERVATIONS, WINTER 1978-79 (THROUGH MARCH 7, 1979)

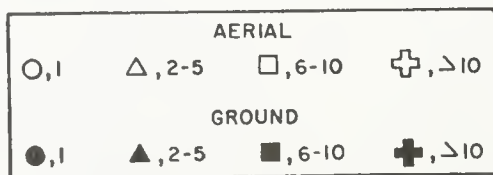


Table 9. Classification summary for white-tailed deer observed in the Circle West area, March 1978-March 1979.

Period	Number of Groups	All Groups		Total No. Observed	Total Number Classified
		Group Size	Average Range		
Spring 1978	2	3	3	6	3
Summer 1978	7	2	1-4	11	11
Fall 1978	0	-	-	0	0
Winter 1978 - 79	0	-	-	0	0

Table 10. Classification summary for pronghorn observed in the Circle West area, March 1978 - March 1979.

Period	All Groups				Fully Classified Groups Only						
	Number of Groups	Group Size Average	Group Size Range	Total No. Observed	Total No. Classified	Total Adults	Adult Males	Adult Females	Young 100 Adults	Young/ 100 Females	Males/ Females
Spring 1978	150	4	1-17	617	71	71	22	49	0	0	-
Summer 1978	111	4	1-16	412	342	240	80	160	102	42.5	63.8
Fall 1978	74	5	1-48	373	238	159	61	98	79	49.7	80.6
Winter 1978-79	1	3	3	3	0	-	-	-	-	-	-

Pronghorn were widely distributed throughout the mine study area during the spring through fall period with areas of heaviest use in the north-central and southwestern portions. The southern and central portions of the proposed mining area apparently receive the most use (Figures 5 - 7).

BIRD COMMUNITY PARAMETERS

Waterfowl Communities

While 1977 was abnormally dry, and waterfowl habitat quality in the study area was relatively poor, 1978 was a wet year (Table 1), and waterfowl use and production was consequently much higher in 1978. Many stock-ponds which were dry in the spring and early summer of 1977 were full or nearly full throughout 1978, providing nearly optimal breeding conditions in the study area.

Breeding season species composition of all recorded waterfowl and water bird observations is presented in Table 11. Monthly changes in waterfowl species composition, as well as 1977 - 1978 changes, are portrayed graphically in Figure 8. It is evident that the mallard is the predominant waterfowl species, although it constituted a relatively smaller proportion of the total waterfowl community in 1978. During both years, the mallard, American wigeon, and blue-winged teal, northern shoveler, gadwall, pintail, and lesser scaup showed an increase in 1978. Species composition in 1978 was similar to that reported by Rundquist (1973) in a Phillips County, Montana study.

Waterfowl breeding season census data for the proposed mining area and mine study area are summarized in Table 12. These data are converted to production and density estimates in Table 13. It can be seen that the densities of pairs and broods on the mine study area are lower than estimates reported for similar habitats by Bue et al. (1952), Gjersing (1971), Lokemoen (1973), and Brewster et al. (1976). The proposed mining area, however, supported breeding waterfowl densities roughly twice those of the mine study area; these densities are near the low end of the range for the other studies mentioned above. In terms of density per unit water area, the proposed mining and mine study area compare favorably to estimates reported for other areas.

Data on broods observed during 1978 are presented in Table 14.

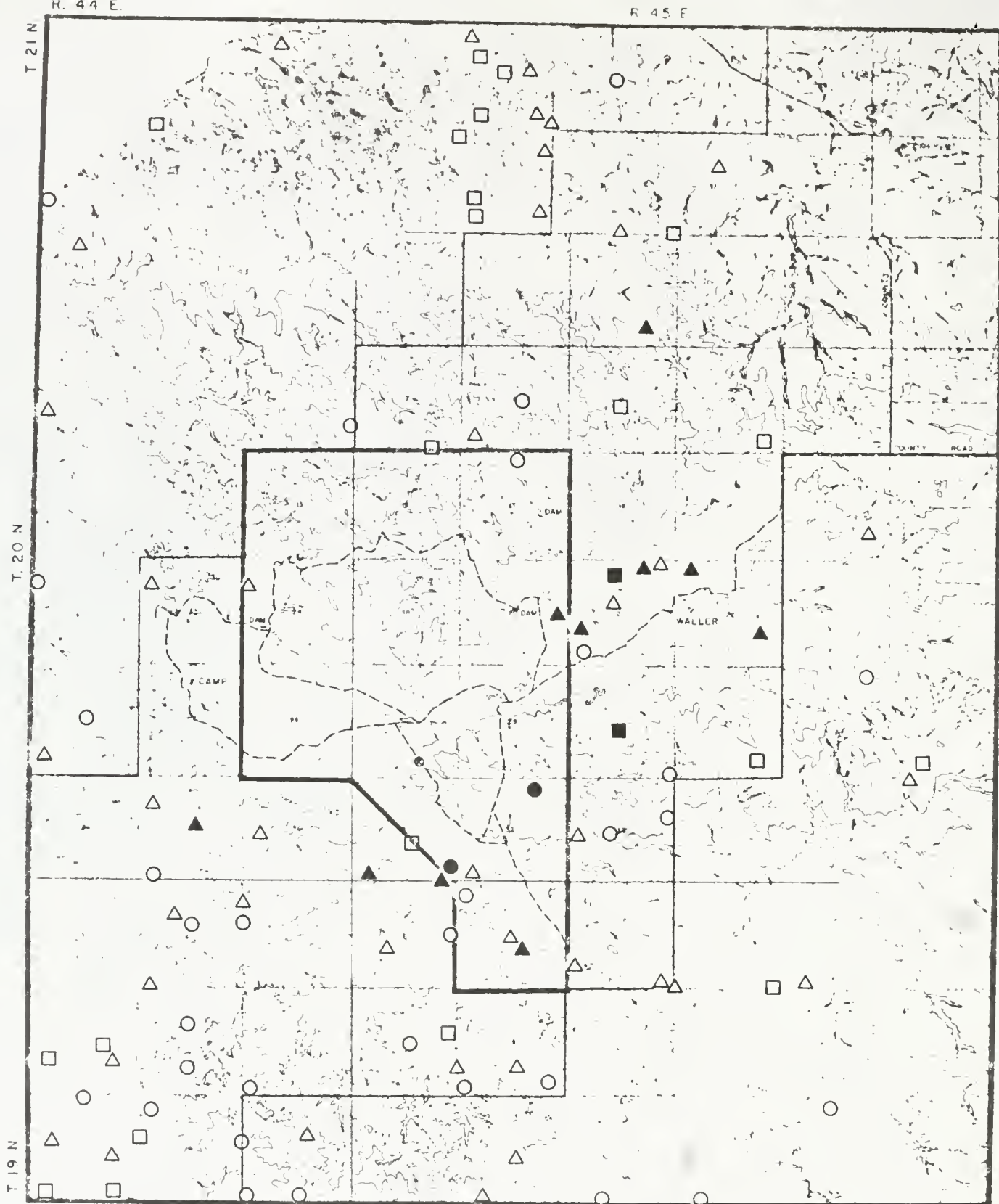


FIGURE 5. PRONGHORN OBSERVATIONS, SPRING 1978

AERIAL			
O, 1	△, 2-5	□, 6-20	⊕, > 20
GROUND			
●, 1	▲, 2-5	■, 6-20	⊕, > 20

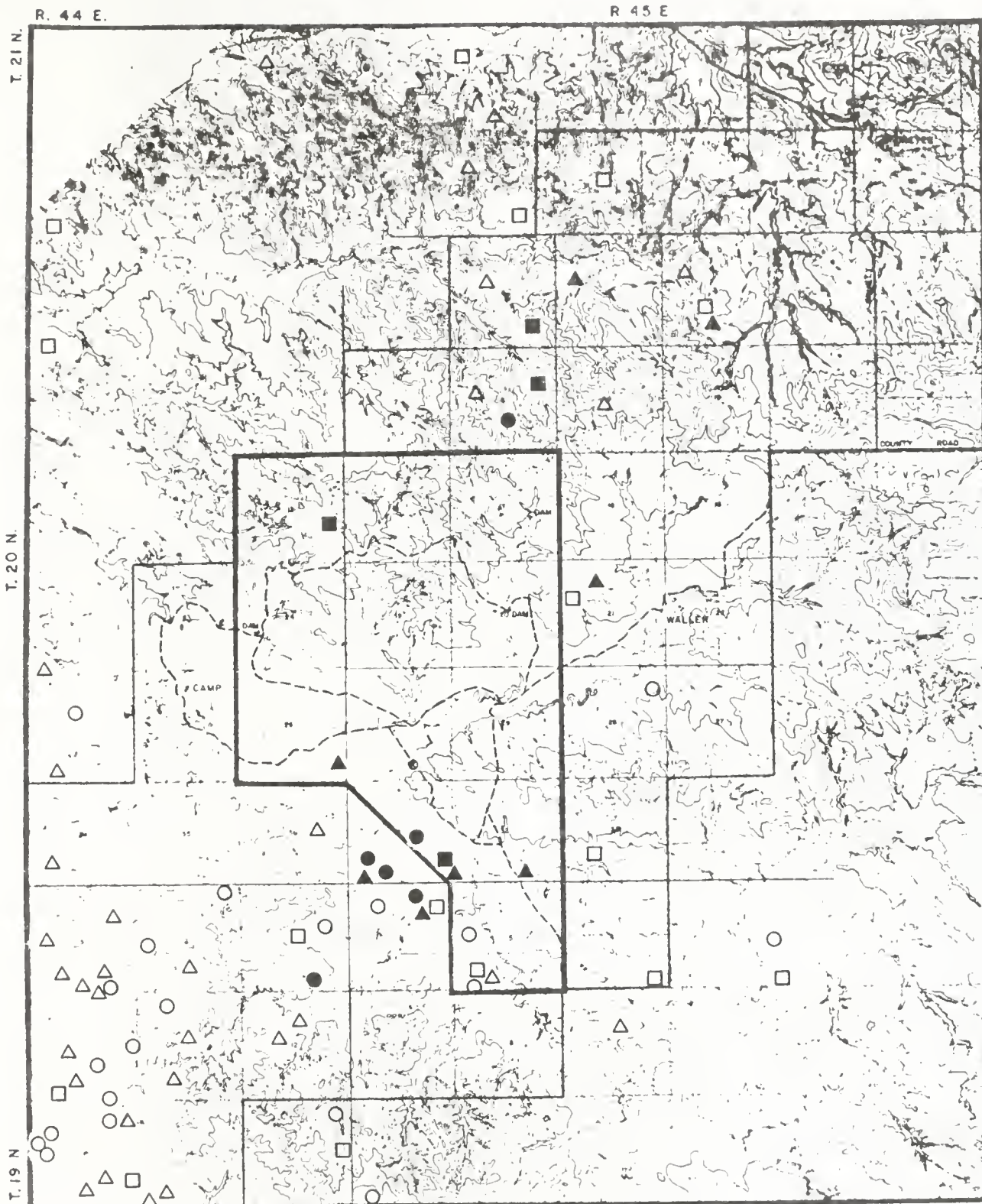
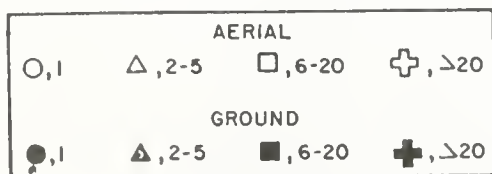


FIGURE 6. PRONGHORN OBSERVATIONS, SUMMER 1978



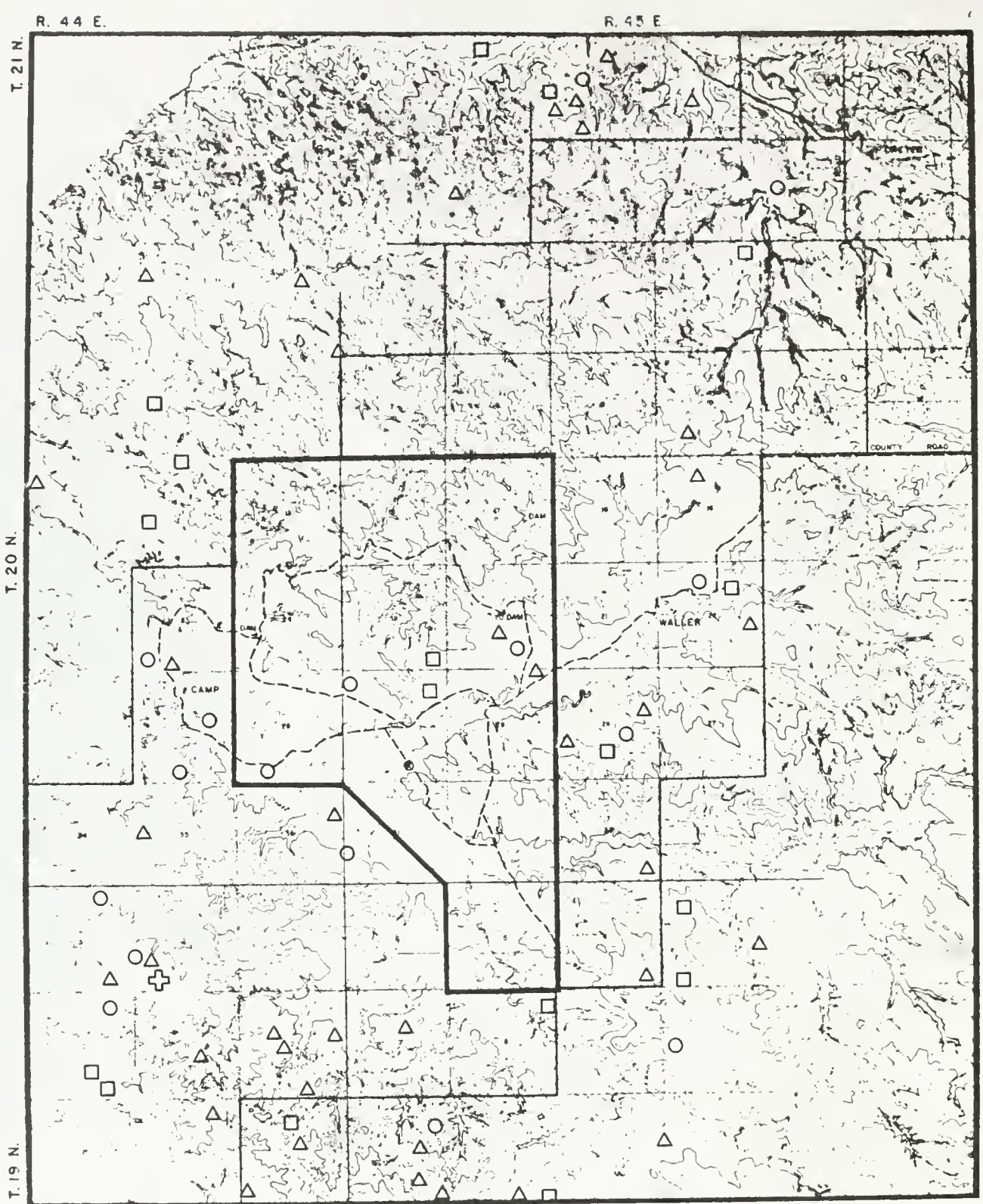


FIGURE 7 PRONGHORN OBSERVATIONS, FALL 1978

AERIAL			
○, 1	△, 2-5	□, 6-20	⊕, ≥20
GROUND			
●, 1	▲, 2-5	■, 6-20	⊕, ≥20

Table 11. Species composition of all recorded waterfowl and large water bird observations made during May-July, 1978 in the Circle West Mine Study Area.

	May 1978	June 1978	July 1978	TOTAL May-July 1978
<u>Ducks and Geese</u>				
Canada Goose	8(1) ^{1/}	0(0)	0(0)	8(tr)
Mallard	166(20)	204(45)	58(15)	428(26)
Gadwall	63(8)	22(15)	39(10)	124(8)
Pintail	50(6)	28(6)	8(2)	86(5)
Green-winged Teal	35(4)	19(4)	9(2)	63(4)
Blue-winged Teal	214(26)	58(13)	77(20)	349(21)
American Wigeon	159(19)	68(15)	150(40)	377(23)
Northern Shoveler	100(12)	15(3)	28(7)	143(9)
Redhead	0(0)	4(1)	1(tr)	5(tr)
Ring-necked Duck	1(tr)	3(tr)	0(0)	4(tr)
Canvasback	1(tr)	0(0)	2(tr)	3(tr)
Lesser Scaup	19(2)	30(7)	1(tr)	50(3)
Common Goldeneye	0(0)	1(tr)	0(0)	1(tr)
Bufflehead	3(tr)	0(0)	0(0)	3(tr)
Ruddy Duck	0(0)	3(tr)	3(tr)	6(tr)
Unidentified Duck	45	16	163	224
<u>Other Large Water Birds</u>				
Common Loon	1	0	0	1
Horned Grebe	3	0	0	3
Eared Grebe	9	18	8	35
Pied-billed Grebe	1	3	6	10
D.C. Cormorant	23	7	16	46
American Coot	3	23	23	49
<u>Tot. Classified</u>	819	455	376	1650

^{1/} Number observed (percent of all waterfowl identified to species)

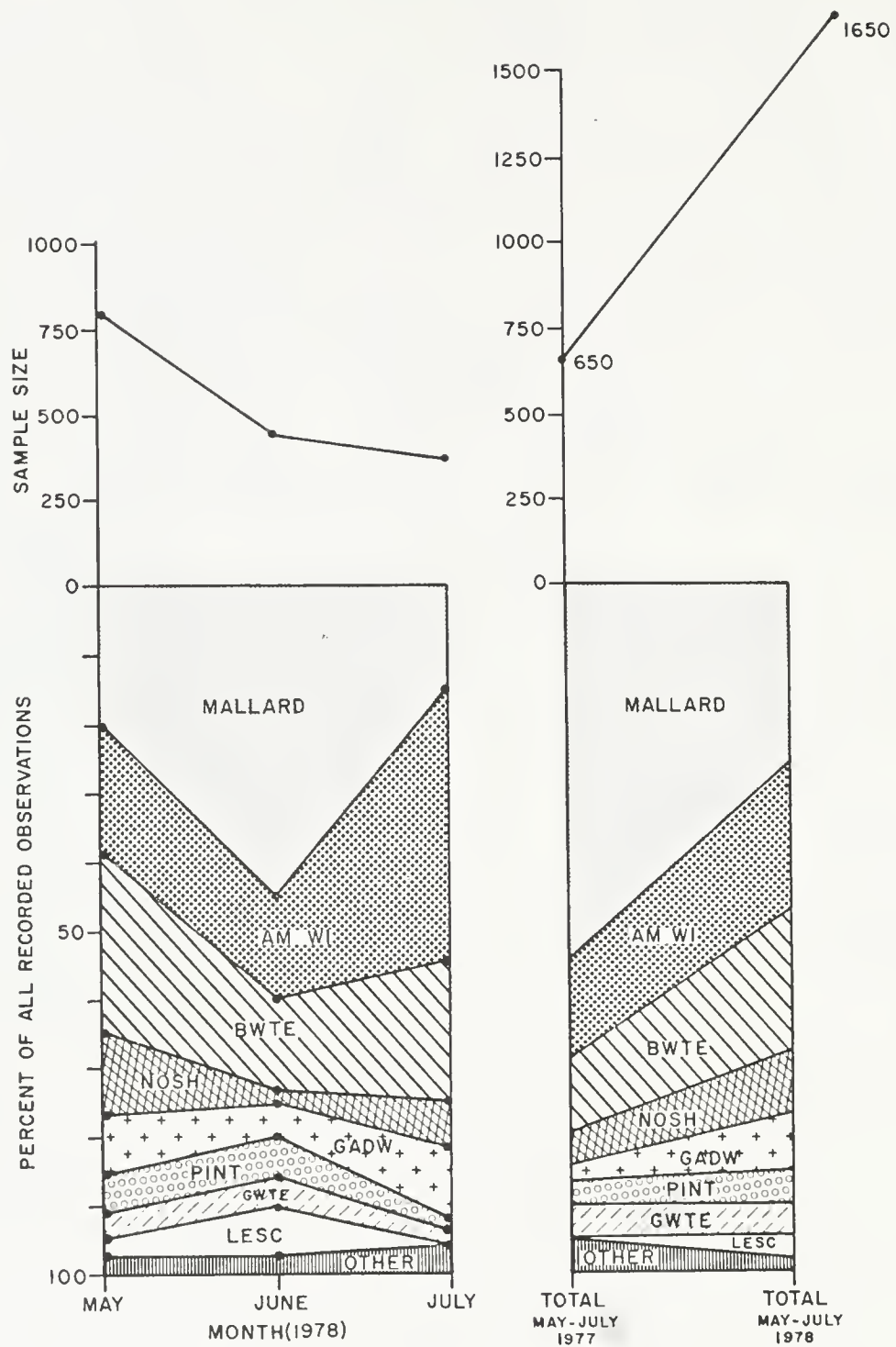


Figure 8. Percent species composition of all recorded 1978 waterfowl observations, Circle West Study Area (1977-78 changes also shown).

Table 12. Summary of waterfowl breeding season census data for stockponds in the Circle West Mine Study Area, 1978.

Species	Proposed Mining Area ^{1/}	Mine Study Area ^{2/} ^{3/}
<u>ANATIDAE</u>		
Mallard	10(5,30) ^{4/}	27(15,84)
Gadwall	2(0,0)	8(3,27)
Pintail	2(0,0)	4(0,0)
Green-winged Teal	2(1,2)	3(1,2)
Blue-winged Teal	6(5,26)	21(12,62)
American Wigeon	10(6,53)	25(17,114)
Northern Shoveler	2(0,0)	7(2,15)
Redhead	-	2(0,0)
Ring-necked Duck	-	1(0,0)
Lesser Scaup	1(0,0)	7(0,0)
Ruddy Duck	-	2(0,0)
Unidentified Duck	2(2,5)	4(4,12)
TOTAL ANATIDAE	37(19,116)	111(53,316)
<u>OTHER LARGE WATER BIRDS</u>		
Eared Grebe	-	2(0,0)
Pied-billed Grebe	-	1(1,2)
Unknown Grebe	-	1(1,5)
American Coot	-	2(1,2)

^{1/} Includes stockponds Nos. MA01-MA10 and MAFW

^{2/} Includes proposed mining area

^{3/} Not all of mine study area was censused in 1978--only ponds MC05-7, MC09, NC01-6, NC08-15 were censused.

^{4/} Minimum number of indicated pairs (number of broods, minimum number of young known present)

Table 13. Waterfowl production data for the Circle West area (1978) and several other areas of the northern Great Plains.

Area	Broods		Young		Min. No. Pairs (Incl. brood data)	
	No./total area ² /	No./water area ³ /	No./total area ² /	No./water area ³ /	No./total area ² /	No./water area ³ /
Mine Study Area ^{1/ 4/}	0.3 (0.8)	2.7 (1.1)	1.8 (4.8)	16.4 (6.6)	0.6 (1.7)	5.8 (2.3)
Proposed Mining Area ^{5/}	0.6 (1.7)	6.3 (2.5)	3.9 (10.1)	38.7 (15.5)	1.2 (3.2)	12.3 (4.9)
Southwest Slope Region, No. Dakota (Lokemoen 1973)	0.5 (1.4)	3.2 (0.8)	-	-	1.3 (3.3)	7.7 (1.9)
Pierre Hills Region, So. Dakota (Bue et al. 1952)	1.7 (4.5)	6.1 (1.5)	-	-	2.7 (7.0)	9.3 (2.3)
Phillips Co., Montana (Gjersing 1971)	0.8 (2.2)	6.5 (1.6)	-	-	1.3 (3.3)	6.1 (1.5)

1/ Including proposed mining area but only part of mine study area (areas A, X, and the southeastern portion only of S, WBS p. 219).

2/ km² (mi²)

3/ ha⁻¹ (acres⁻¹)

4/ Density estimates based on an estimated census area of 171 km² (66 mi²) and a water area of 19.3 ha (47.7 acres)

5/ Density estimates based on a census area of 30 km² (11.5 mi²) and a water area of 3.0 ha (7.5 acres)

Table 14. Average sizes of waterfowl broods recorded in the mine study area during 1978.

Mallard	5.60 (2-9,n=15) ^{1/}
Gadwall	9.00 (7-12,n=3)
Green-winged Teal	2.00 (n=1)
Blue-winged Teal	5.17 (3-7,n=12)
American Wigeon	6.71 (3-12,n=17)
Northern Shoveler	7.50 (7-8,n=2)

^{1/} range and sample size in parentheses

Breeding Bird Census

Table 15 summarizes 1977 and 1978 results for the five breeding bird census plots. A more complete account of 1978 results is given in Appendix C, and plot descriptions can be found in Appendix F of the WBS.

The spectacular increase in grass production in 1978 was reflected by changes in breeding bird densities on the grassland plots. Lark buntings established breeding territories on the grassland plots for the first time in 1978, and chestnut-collared longspur densities increased markedly above 1977 densities. Total number of territories, total density, and total biomass showed a sizable increase on both grassland plots in 1978, while single and two-species dominance decreased.

Total species number and species diversity remained unchanged for the five plots combined, and species and community parameters for the shrub-dominated plots were similar both years.

Roadside Wildlife Survey

Data obtained during the fifteen 1978 roadside survey runs are presented in Appendix D. The cumulative numbers of species for all May-July runs (1977-1978) are presented in Table 16. Species number, richness, and species diversity showed a general increase in 1978, probably related to moister conditions and increased diversity of water birds. (The number of species and individuals of anatidae and other large water birds showed a marked increase in 1978). The relative sequence of routes with respect to community parameters was similar to that observed in 1977, with the exception of the Circle route, which showed a disproportionately large increase in diversity.

Table 17 summarizes 1977-78 changes in May-July sample abundances of selected species, based on data obtained during runs of the five roadside survey routes. The ring-necked pheasant, mourning dove, and black-billed magpie showed highly significant decreases in sample abundances from 1977 to 1978 ($p < .01$), while Baird's sparrow and chestnut-collared longspur showed significant increases ($.01 < p < .05$). The apparent increase in Baird's sparrow is believed to be an artifact of increased observer familiarity with songs of that species.

Figure 9 shows a two-dimensional ordination of 1977 and 1978 species abundances for selected species sampled by the roadside routes. The first two factors together accounted for 20.3 percent of the observed variation in sample abundances. Factor I separates species according to foliage height diversity, with species preferring grassy or badlands

Table 15. Summary of 1977-1978 breeding bird census data, Circle West study.

Species	1. Silver Flat		2. Silver Buffalo- berry Red Osier Dogwood		3. Silver Buffalo- berry Silver Sagebrush		4. Needle- and-Thread Blue Grama Grassland		5. Western Wheatgrass - Blue Grama Pasture		TOTALS	
	1977	1978	1977	1978	1977	1978	1977	1978	1977	1978	1977	1978
Mallard	+	-	-	-	-	-	-	-	-	-	+	-
Red-tailed Hawk	-	-	-	-	+	+	-	-	-	-	+	+
Golden Eagle	-	-	-	-	-	-	-	-	-	-	+	-
Marsh Hawk	+	+	+	+	-	-	-	-	-	-	+	+
Prairie Falcon	+	-	-	-	+	+	+	+	+	+	+	+
Sharp-tailed Grouse	-	2	-	-	-	-	-	-	-	-	+	2(2,1)
Ring-necked Pheasant	-	-	-	-	-	-	-	-	-	-	1(1, tr)	1
Killdeer	-	-	-	-	1	1	-	-	-	-	+	+
Mourning Dove	-	-	-	-	-	-	-	-	-	-	14(11,5)	11(9,4)
Common Nighthawk	2	1	3(12,5)	4(16,6)	9(36,15)	6(24,10)	-	-	-	-	-	3(2,1)
Eastern Kingbird	-	-	3(12,5)	3(12,5)	3(12,5)	2	-	-	-	-	9(7,3)	7.5(6,2)
Say's Phoebe	3(13,5) ^{a/}	2	2	+	-	-	-	-	-	-	2(2,1)	+
Horned Lark	1	+	3(12,5)	1	4(16,6)	4(16,6)	11(44,18)	12(48,19)	8(32,13)	10(40,16)	27(22,9)	27(22,9)
Rock Wren	-	-	3(12,5)	2.5(10,4)	-	-	-	-	-	-	3(2,1)	2.5(2,1)
Brown Thrasher	1	-	5(20,8)	5.5(22,9)	4(16,6)	3(12,5)	-	-	-	-	10(8,3)	8.5(7,3)
Sprague's Pipit	3(13,5)	2	+	-	-	-	-	-	-	-	3(2,1)	2(2,1)
Loggerhead Shrike	1	1	1	1	2	3(12,5)	-	-	-	-	4(3,1)	5(4,2)
Yellow Warbler	-	-	5(20,8)	6(24,10)	-	-	-	-	-	-	5(4,2)	6(5,2)
Common Yellowthroat	8(33,13)	6(25,10)	-	-	-	-	-	-	-	-	8(6,3)	6(5,2)
Yellow-breasted Chat	-	-	1	-	-	-	-	-	-	-	1(1, tr)	-
Bobolink	-	+	+	-	-	-	-	-	-	-	+	+
Western Meadowlark	7(29,12)	6(25,10)	8(32,13)	6(24,10)	8(32,13)	7.5(30,12)	5(20,8)	5.5(22,9)	3(12,5)	3.5(14,6)	31(25,10)	27.5(22,9)
Red-winged Blackbird	-	+	-	-	-	-	-	-	-	-	-	+
Brewer's Blackbird	-	-	+	+	-	-	-	-	+	-	+	+
Brown-headed Cowbird	1	1	2	2	1	2	-	-	-	-	4(3,1)	5(4,2)
Rufous-sided Towhee	-	-	10(40,16)	6(24,10)	-	-	-	-	-	-	10(8,3)	6(5,2)
Lark Bunting	16(67,27)	5(21,8)	-	-	2	7(28,11)	-	6.5(26,11)	7(28,11)	18(15,6)	25.5(21,8)	25.5(21,8)
Grasshopper Sparrow	5(21,8)	3.5(15,6)	-	-	-	-	1	3(12,5)	-	6(5,2)	6.5(5,2)	1.5
Baird's Sparrow	1	1.5	-	-	-	-	-	-	-	-	-	-
Vesper Sparrow	-	-	-	-	+	-	2	-	-	-	3(2,1)	-
Lark Sparrow	-	-	2	4.5(18,7)	-	-	-	-	-	-	2(2,1)	4.5(4,2)
Brewer's Sparrow	9(38,15)	10(42,17)	-	-	-	-	-	-	+	-	9(7,3)	10(8,3)
Chestnut-collared Longspur	1	1	-	-	-	-	-	-	-	-	28	19
Total Number of Species ^{b/}	17	17	16	15	12	11	5(20,8)	10(40,16)	1	5.5(22,9)	28	28
Adj. Number of Species ^{b/}	14	12	13	11	8	9	5	5	3	4	20	19
Total No. of Territories ^{b/}	59	42	48	42	34	38.5	24	37	12	26	177	185.5
Species Diversity ^{b/}	(246.99)	(175.71)	(192.78)	(168.68)	(136.55)	(154.62)	(96.39)	(148.60)	(48.19)	(104.42)	(143.58)	(150.61)
Total Density (ind./km ²) ^{b/}	2.268	2.348	2.348	2.261	1.951	2.152	1.351	1.511	0.824	1.319	2.674	2.672
Total Biomass(g/ha) ^{b/}	362	362	400	348	288	323	200	307	100	215	298	310
Single Species Dominance(%)	193.12	280.58	220.44	206.55	337.04 ^{d/}	347.52	92.04	135.80	52.6	96.92	180.48	212.93
a/ Number of territories (territories/km ² , territories/100 acres)	27	24	21	14	26	19	46	32	67	38	18	15

b/ Does not include species represented by partial territories; gallinaceous birds also omitted from adjusted number of species.

c/ Total density = (2x total No. of territories + 1/2 No. of W. Meadowlark territories)/km².

d/ Includes 104.32 g/ha of Ring-necked Pheasant alone.

tr = trace (<.5%)

+ = partial territory.

Table 16. Summary of cumulative numbers of species observed during May through July roadside counts, Circle West study.

	BaseLine Study (1977 Runs)		Through First Monitoring Period (1977-1978 Runs)	
	4 Rtes. ^{1/}	5 Rtes.	4 Rtes. ^{1/}	5 Rtes.
<u>AMPHIBIANS</u>				
Total Number of Species	2(50.0) ^{2/}	2(50.0)	2(40.0)	2(40.0)
<u>REPTILES</u>				
Total Number of Species	1(14.3)	1(14.3)	1(14.3)	1(14.3)
<u>BIRDS</u>				
Total Number of Species(T)	82(59.0)	88(63.3)	105(65.6)	110(68.8)
Summer Residents(S)	67(78.8)	72(84.7)	80(87.0)	83(90.2)
Permanent Residents(R)	15(88.2)	15(88.2)	16(94.1)	16(94.1)
Non-breeding Summer Vis.(V)	0(0)	1(33.3)	1(20.0)	1(20.0)
Migrants(M)	0(0)	0(0)	8(22.2)	10(27.8)
Winter Residents	0(0)	0(0)	0(0)	0(0)
Total Breeding (S+R)	82(80.4)	87(85.3)	96(88.1)	99(90.8)
<u>MAMMALS</u>				
Total Number of Species	14(53.9)	14(53.9)	15(55.6)	15(55.6)
<u>TOTAL VERTEBRATE SPECIES</u>	99(56.3)	105(59.7)	123(61.8)	128(64.3)

^{1/} Excluding Dreyer Ranch Route

^{2/} Number of species (percentage of totals for reconnaissance study area, Table 5).

Table 17. Summary of 1977-78 changes in May-June sample abundances of selected species sampled by five roadside survey routes, Circle West area.

Species	1977-78 change ^{1/}
Sharp-tailed Grouse	NS
Ring-necked Pheasant	D**
Killdeer	NS
Mourning Dove	D**
Eastern Kingbird	NS
Horned Lark	NS
Black-billed Magpie	D**
Sprague's Pipit	NS
Loggerhead Shrike	NS
Yellow Warbler	NS
Common Yellowthroat	NS
House Sparrow	NS
Western Meadowlark	NS
Red-winged Blackbird	NS
Rufous-sided Towhee	NS
Lark Bunting	NS
Savannah Sparrow	NS
Grasshopper Sparrow	NS
Baird's Sparrow	I*
Vesper Sparrow	NS
Brewer's Sparrow	NS
Chestnut-collared Longspur	I*

^{1/} NS=no significant change; D=significant decrease; I=significant increase

* .01 < p < .05 (paired t-test)

** p ≤ .01

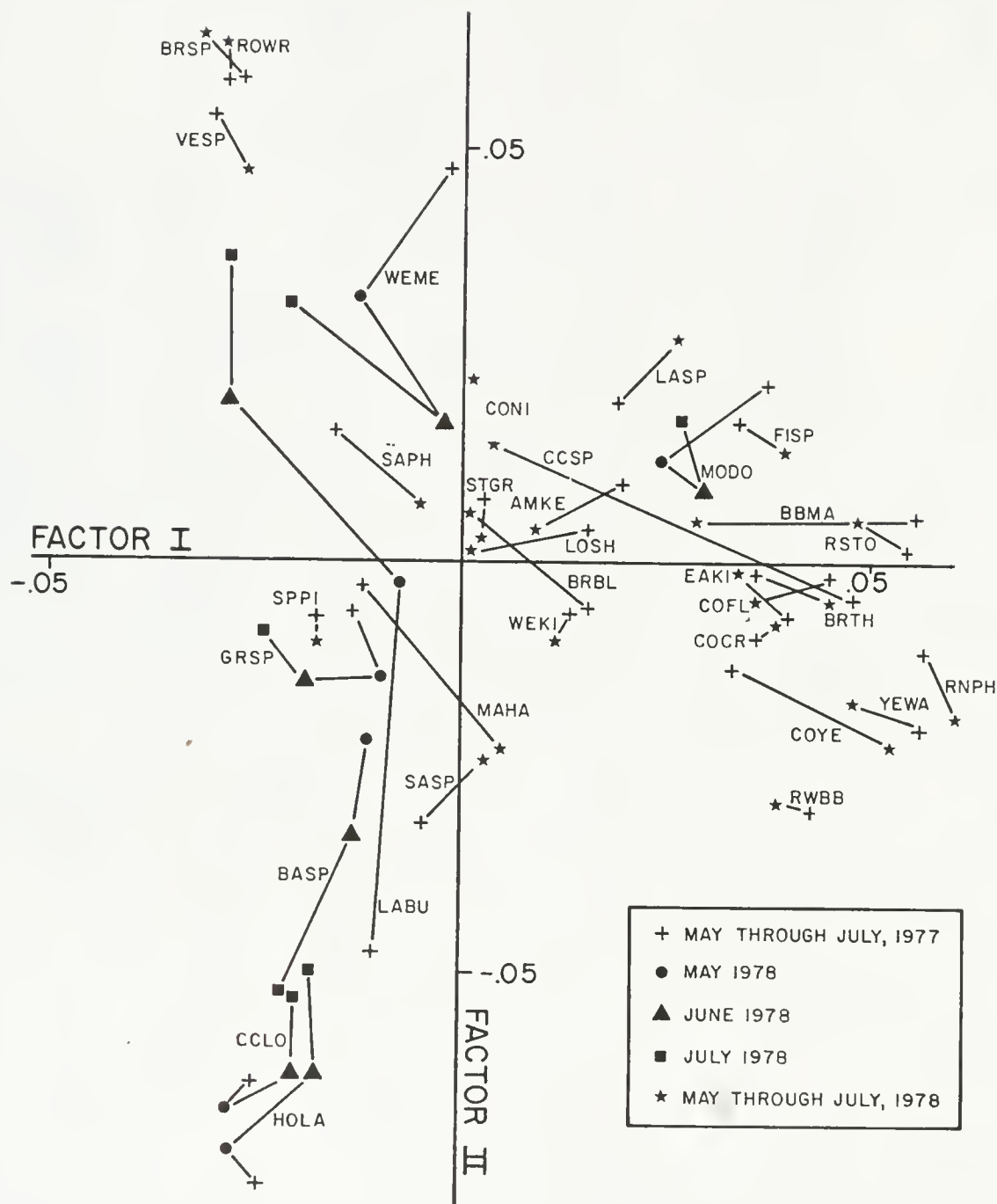


Figure 9.

Two-dimensional ordination of selected species along Factors I and II showing 1977-1978 changes.

receiving low factor scores and those preferring trees or tall shrub-dominated habitats receiving high values. Factor II seems related to habitat homogeneity, canopy coverage, and topographic diversity--species preferring complex, heavily dissected badlands habitats with steep slopes receive high factor scores, and species preferring flat to rolling homogeneous grasslands receive low factor scores. As shown in the figure, habitat preferences for most species were remarkably similar between months and years. Only seven species showed major differences (as indicated by Euclidean distance ≥ 0.02 in the factor scores). The Western Meadowlark appeared to select flatter, grassier habitats in 1978, as did the Marsh Hawk. The Common Yellowthroat preferred habitats of higher foliage height diversity in 1978, while the Clay-Colored Sparrow showed the opposite trend. Baird's Sparrow (not encountered in 1977) showed a habitat shift toward flatter, higher grasslands as the breeding season progressed. Horned Larks selected somewhat more diverse terrain in 1978. The most spectacular habitat shift was shown by the Lark Bunting, which preferred flat, rolling grassland along the Circle and Dreyer Ranch routes in 1977 and sagebrush-badland habitats along the Flowing Well route in 1978.

SMALL MAMMAL COMMUNITY PARAMETERS

Small mammal capture data for 1978 are summarized in Table 18. As in 1977, small mammal population densities were highest in tall coulee shrub habitats. The first long-tailed vole of the trapping program was taken in this habitat in 1978.

Table 18. Summary of small mammal snap-trap data, May-October, 1978

Habitat Category Treatment ^{1/}	Blue Grama - Needle-and- thread Grassland		Western Bulrush		Silver Sagebrush		Tall Coulee Shrubby		TOTALS
	C	E	C	E	C	E	C	E	
Location Number	17	34	15	20	33	18	44	35	All
Number of Trap Nights (TN)	300	300	300	300	300	300	300	300	2400
Trapping Schedule ^{2/}	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10
CAPTURES/100 TN									
Meadow Vole	-	-	-	-	-	0.67	0.33	-	0.13
Prairie Vole	-	-	-	-	0.33	-	-	1.00	0.17
Long-tailed Vole	-	-	-	-	-	-	0.33	-	0.04
Deer Mouse	0.67	0.33	0.33	1.00	0.33	1.33	11.00	4.33	2.42
Total Captures/100 TN	0.67	0.33	0.33	1.00	0.67	2.00	11.67	5.33	2.75
Number of Species	1	1	1	1	2	2	3	2	4
Biomass (g/100 TN)	10.00	7.70	5.40	20.00	27.00	55.70	215.65	120.21	57.71
Biomass Increase (g/100 TN)	10.00	7.70	5.40	20.00	-27.00	55.70	152.35	95.49	40.08

^{1/} C=Control; E=Experimental

^{2/} Month of first trapping/month of last trapping

ERRATUM
to
Wildlife Baseline Study

<u>Page</u>	<u>Correction</u>
19	In the upper right of the map, NC09 should be MC09. Near the bottom of the map, NC10 should be NC17.
21	Line 4. "Comple" should be "Complex."
39	Line 10. Change "species; and species" to "species i and species j."
44	Change "Sharp-skinned Hawk" to "Sharp-shinned Hawk."
47	Change "Bank Sqaallow" to "Bank Swallow."
49	Change "Warbling Viveo" to "Warbling Vireo."
143	Right-hand Column, "19(1)" should be moved one column to the left.
145	Numbers in columns indicate percentage of total observations.
151	Total density for plot 1 is 506.5, not 484. Footnote d, Change equals sign between parentheses to plus sign.
154	Table 34, Column 3, change "Morning Dove" to "Mourning Dove."
169	Last sentence should read "...which equals the amount of variation in the dependent variables which is att- ributable to the independent variables, is given..."
193	Line 4. Change "Watering" to "Wintering."
212	Reference 6. Change "Walcheek" to "Walcheck."
222	Line 11. Change "or" to "of."

ACKNOWLEDGEMENTS

During the 1978-79 monitoring period data were gathered by: B. Blanchard, MDFWP (March aerial flights); R. DeSimone, MDFWP (September and October aerial flights); P. Martin, MDFWP (April - August aerial flights and ground surveys); P. Nichols (fall small mammal trapping); R. Stoneberg, MDFWP (January - March aerial flights); D. Sullivan (spring small mammal trapping, breeding bird census, and general ground survey); and L. Thompson, DNRC (project coordinator, roadside wildlife surveys, breeding bird census, and general ground surveys). G. Cawlfeld (DNRC), E. Madej, P. Nichols, and L. Thompson performed the data analyses, and Rose Ann Montgomery typed the manuscript. This report was prepared by L. Thompson of DNRC and was funded by Dreyer Brothers, Inc. Special thanks are again extended to M. McKeever and family and to the Wallers for their help in the field.

LITERATURE CITED

- Berg, P.F. 1956. A study of waterfowl broods in eastern Montana with special reference to movements and the relationship of reservoir fencing to production. *J. Wildl. Manage.* 20:253-262.
- Brewster, W.G., J.M. Gates, and L.D. Flake. 1976. Breeding waterfowl populations and their distribution in South Dakota. *J. Wildl. Manage.* 40:50-59.
- Bue, I.G., L. Blankenship, and W.H. Marshall. 1952. The relationship of grazing practices to waterfowl breeding populations and production on stock ponds in western South Dakota. *trans. N. Amer. Wildl. Conf.* 17:396-414.
- Gjersing, Frank M. 1971. A study of waterfowl production on two rest rotation grazing units in northcentral Montana. M.S. Thesis, Montana State University. 42 pp.
- Hammond, M.C. 1969. Notes on conducting waterfowl breeding population surveys in the north central states. Pages 238-254 in Saskatoon Wetlands Seminar. *Can. Wildl. Serv. Rep. Ser. G.*
- Lokemoen, J.T. 1973. Waterfowl production of stock-watering ponds in the Northern Plains. *J. Range Manage.* 26:179-184
- Montana Department of Natural Resources and Conservation. 1978. Circle West Wildlife Baseline Study, Technical Report No. 2, Helena, Mt.
- Montana Department of Natural Resources and Conservation. 1979. Circle West Vegetation Monitoring Study, Technical Report No. 3, Helena, Mt.
- Rundquist, V.M. 1973. Avian ecology on stock ponds in two vegetational types in northcentral Montana. Phd. Thesis, Montana State University. 112 pp. 1973.
- Stewart, R.E., and H.A. Kantrud. 1973. Ecological distribution of breeding waterfowl populations in North Dakota. *J. Wildl. Manage.* 37:39-50.

NORTHERN RESOURCES INC.

Arch - fyi *ED - fyi + Hla*
BF *7/18*
704 First Northwestern Bank Center
175 North 27th Street
Billings, Montana 59101
Telephone (406) 259-4521
Mo
L.P.

January 26, 1979

Mr. Ted J. Doney, Director
Montana Department of Natural
Resources & Conservation
32 South Ewing
Helena, Montana 59601

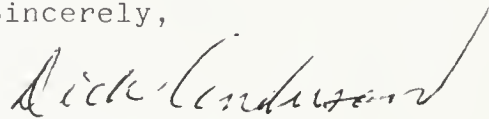
Dear Ted:

This is in response to your letter of 15 January pertaining to continuation of maintenance of the wildlife monitoring work and the monitoring of the vegetation study. The budget for these services is satisfactory and you are requested to proceed with the work outlined in your letter and discussed by us in our last meeting.

With regard to the major stream crossings, we have budgeted funds for installation of culverts and will commence work on installation as soon as the weather gives us a break. I trust this will solve the access problems which your staff have encountered in the past.

Kindest regards.

Sincerely,



Richard E. Anderson
President

REA/dt

cc: Governor Judge
Leo Berry
Dave Gleason



DEPARTMENT OF STATE LANDS

MAILING ADDRESS: CAPITOL STATION
OFFICE: 1625 11TH AVENUE

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March 20, 1978

Larry Thompson
Department of Natural Resources
and Conservation
25 South Ewing
St. John's Hospital Building
Capitol Station
Helena, Montana 59601

Re: Circle West Project
Wildlife survey

Dear Larry:

I have reviewed your submittal of 3/14/78 entitled,
"Circle West Wildlife Monitoring Program". The program
should provide the necessary data for the monitoring
program.

The number of flights/month should be adequate, but
since the area is very large, it may be necessary to expand
this portion of the study depending upon results achieved
this year.

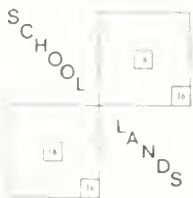
Since waterfowl species such as geese may start nesting
earlier than May, it may be wise to plan some waterfowl
specific work in April.

I will attempt to accompany you on a few field trips this
year.

Sincerely,

Richard L. Juntunen
Reclamation Division

lw



MINING



RECLAMATION

APPENDIX C

SILVER SAGEBRUSH FLAT--Location: Montana; McCone County; SE quarter of Sec. 31, T20N, R45E; 47° 25' N, 106°1' W, AMS, Jordan (NL 13-1). Continuity: Established 1977; 2 consecutive years. Size: 24 ha = 59.3 acres (rectangular, 300 x 800 m, paced). Description of Plot: see AB 32:107 (1978). Coverage: May 23, 24, 26, 28; June 15, 17, 19, 20; July 20; 9 trips, 0450-2030. Total man-hours: 15.6. Census: Brewer's Sparrow, 10 (42, 17); Common Yellowthroat, 6 (25, 10); Western Meadowlark, 6 (25, 10); Lark Bunting, 5 (21, 8); Grasshopper Sparrow, 3.5 (15, 6); Sharp-tailed Grouse, 2; Eastern Kingbird, 2; Sprague's Pipit, 2; Baird's Sparrow, 1.5; Mourning Dove, 1; Loggerhead Shrike, 1; Brown-headed Cowbird, 1; Chestnut-collared Longspur, 1; Marsh Hawk, +; Horned Lark, +; Bobolink, +; Red-winged Blackbird, +. Total: 17 species; 42 territorial males or females (175/km², 71/100 acres). Visitors: Mallard, Gadwall, Common Nighthawk, Cliff Swallow, Brown Thrasher, Brewer's Blackbird. Remarks: Three nests were found within the plot: Marsh Hawk, 1 with 6 young; Eastern Kingbird, 1 with 4 young; and Loggerhead Shrike, 1 with 6 young. Bobolink and Baird's Sparrow were not seen in the vicinity in 1977, but were quite common in 1978. The Horned Lark, Sprague's Pipit, Baird's Sparrow, and Chestnut-collared Longspur territories were all located in grassland outside the sagebrush flat, and overlapped the plot only partially. The Eastern Kingbird and Loggerhead Shrike nested in the isolated clumps of Silver Buffalo-berry near the northeastern end of the plot. Common Yellowthroats were restricted to patches of Snowberry along the drainage bottom, and the Marsh Hawk nest was located in a dense Snowberry patch very near the location of last year's nest. The Sharp-tailed Grouse were seen repeatedly on the plot, and although no broods were observed, breeding is probable since a lek was located within the NE corner of the plot. Other vertebrates encountered on the plot during census runs: Prairie Rattlesnake (Crotalus viridis), White-tailed Jack-rabbit (Lepus townsendi) Mule Deer, (Odocoileus hemionus), White-tailed Deer (O. virginianus), Pronghorn (Antilocapra americana).

SILVER BUFFALOBERRY-RED OSIER DOGWOOD COULEE-- Location: Montana; McCone County; overlaps boundary of Sec. 3 and 10, T20N, R45E; 47° 31' N, 105° 58' W; AMS, Glendive (NL 13-2), Continuity: Established 1977; 2 consecutive years. Size: 25 ha = 61.8 acres (square, paced). Description of Plot: See AB 32:108 (1978). Coverage: May 21, 25, 28, 29; June 16, 17, 18, 20; July 19; 9 trips, 0450-2100. Total man-hours: 21.3. Census: Yellow Warbler, 6 (24, 10); Western Meadowlark, 6 (24, 10); Rufous-sided Towhee, 6 (24, 10); Brown Thrasher, 5.5 (22, 9); Lark Sparrow, 4.5 (18, 7); Mourning Dove, 4 (16, 6); Eastern Kingbird, 3.5 (14, 6); Rock Wren, 2.5 (10, 4); Brown-headed Cowbird, 2; Horned Lark, 1; Loggerhead Shrike, 1; Marsh Hawk, +; Ring-necked Pheasant, +; Say's Phoebe, +; Brewer's Blackbird, +. Total: 15 species, 42 territorial males or females ($168/\text{km}^2$, 68/100 acres). Visitors: Mallard, unidentified falcon, Sharp-tailed Grouse, Great Horned Owl, Common Nighthawk, Least Flycatcher, Black-billed Magpie, Mountain Bluebird, Black-headed Grosbeak, Chipping Sparrow. Remarks: Two nests were located on the plot: Mourning Dove (1 egg), and Eastern Kingbird (3 eggs). Other vertebrates observed on the plot during census runs: Prairie Rattlesnake, Least Chipmunk (Eutamias minimus), White-tailed Jackrabbit, Desert Cottontail (Sylvilagus auduboni), Porcupine (Erethizon dorsatum), Mule Deer.

SILVER BUFFALOBERRY-SILVER SAGEBRUSH COULEE--Location: Montana; McCone County; overlaps border of Sec. 19 and 20, T20N, R45E; 47° 28' N, 106° 1' W, AMS, Jordan (NL 13-1). Continuity: Established 1977; 2 consecutive years. Size: 25 ha = 61.8 acres (square, paced). Description of Plot: See AB 32:108 (1978). Coverage: May 26, 27, 29; June 16, 18, 19, 20, 23; July 20; 9 trips, 0455-2030. Total man-hours: 14.8. Census: Western Meadowlark, 7.5 (30, 12); Lark Bunting, 7 (28, 11); Mourning Dove, 6 (24, 10); Horned Lark, 4 (16, 6); Common Nighthawk, 3 (12, 5); Brown Thrasher, 3 (12, 5); Loggerhead Shrike, 3 (12, 5); Eastern Kingbird, 2; Brown-headed Cowbird, 2; Ring-necked Pheasant, 1; Red-tailed Hawk, +. Total: 11 species, 38.5 territorial males or females ($154/\text{km}^2$, 62/100 acres). Visitors: Sharp-tailed Grouse, Cliff Swallow, Yellow Warbler, Brewer's Blackbird, Grasshopper Sparrow, Lark Sparrow. Remarks: Seven nests were located on the plot: Ring-necked Pheasant, 1 (17 eggs); Common Nighthawk, 1 (2 eggs); Mourning Dove, 1 (1 egg); Loggerhead Shrike, 3 (1 with 4 young, 1 with 5 young, 1 with 6 eggs); Western Meadowlark, 1 (2 young, 2 eggs, 1 Cowbird egg). In addition, an Eastern Kingbird nest (with 4 young) and another Western Meadowlark nest (with 5 eggs) were found within 10 m of the boundaries of the plot. A pair of Red-tailed Hawk nested 0.8 km (0.5 miles) from the plot. Also seen on the plot were Prairie Rattlesnakes and Mule Deer.

NEEDLE-AND-THREAD--BLUE GRAMA GRASSLAND--Location: Montana; McCone County; borders center of E boundary of Sec. 25, T20N, R44E; 47° 27' N, 106° 2' W; AMS, Jordan (NL 13-1). Continuity: Established 1977; 2 consecutive years. Size: 25 ha = 61.8 acres (square, surveyed). Description of Plot: See AB 32:109. Coverage: May 20, 21, 25, 27; June 15, 17, 18, 21; 8 trips, 0445-2045. Total man-hours: 14.6. Census: Horned Lark, 12 (48, 19); Chestnut-collared Longspur, 10 (40, 16); Lark Bunting, 6.5 (26, 11); Western Meadowlark, 5.5 (22, 9); Grasshopper Sparrow, 3 (12, 5); Prairie Falcon, +. Total: 6 species, 37 territorial males or females (148/km², 60/100 acres). Visitors: Marsh Hawk, Killdeer. Remarks: A Horned Lark nest (4 young) and a Chestnut-collared Longspur nest (5 eggs) were located on the plot. Grassland development on the plot was so lush the plot was scarcely recognizable from its condition during the summer of 1977. Needle-and-thread (Stipa comata) was particularly vigorous, attaining a height of nearly 1 m. Prairie Rattlesnakes and a Striped Skunk (Mephitis mephitis) were seen on the plot during census runs.

WESTERN WHEATGRASS--BLUE GRAMA PASTURE--Location: Montana; McCone County; Sec. 23, T20N, R44E; 47° 28' N, 106° 3' W; AMS, Jordan (NL 13-1). Continuity: Established 1977; 2 consecutive years. Size: 25 ha = 61.8 acres (square, paced). Description of Plot: See AB 32:109 (1978). Coverage: May 21, 27, 28; June 15, 16, 19, 21; July 19; 8 trips, 0450-2100. Total man-hours: 13. Census: Horned Lark, 10 (40, 16); Lark Bunting, 7 (28, 11); Chestnut-collared Longspur, 5.5 (22, 9); Western Meadowlark, 3.5 (14, 6); Killdeer, +. Total: 5 species, 26 territorial males or females ($104/\text{km}^2$, 42/100 acres). Visitors: Marsh Hawk, American Kestrel, Wilson's Phalarope, Mourning Dove, Cliff Swallow, Loggerhead Shrike, Red-winged Blackbird, Brewer's Blackbird, Brown-headed Cowbird, Grasshopper Sparrow, Chipping Sparrow. Remarks: A Horned Lark nest with 4 young was found on the plot. On July 19, a flock estimated at 700 Brewer's Blackbirds and Brown-headed Cowbirds was observed using the plot. The increase in Lark Buntings and Chestnut-collared Longspur densities over last year's census is remarkable, and is believed to be due primarily to the relatively lush grassland development. A Prairie Rattlesnake was also observed on the plot.

MAY 1978

APPENDIX D

Species	AOU	ROUTE					TOTAL EXCL. MISC.	TOTAL MISC.
		C	F	P	M	D	EXCLUDED	INCLUDED
PIED-BILLED GREBE . . .	006							
DBL-CR. CORMORANT . .	120		1/1				1/1	1/1
GREAT BLUE HERON . . .	194			1/1			1/1	1/1
BLK-CR. NIGHT HERON .	202							
AM. BITTERN	190							
MALLARD	132	20/4	5/3	6/3	23/8	1/3	54/17	61/21
GADWALL	135	1/1				2/2	1/1	3/3
PINTAIL	143	8/2		4/1	1/1		13/4	13/4
GREEN-WINGED TEAL . .	139			2/1		2/1	2/1	4/2
BLUE-WINGED TEAL . . .	140	4/1		21/1	1/1	13/4	26/3	48/7
AM. WIGEON	137	4/2		1/1		11/6	5/1	16/7
N. SHOVELER	142	3/1		7/1		4/3	10/2	14/5
WOOD DUCK	144							
REDHEAD	146							
CANVASBACK	147	X					X	X
LESSER SCAUP	149					3/2		3/2
RUDDY DUCK	167							
RED-TAILED HAWK . . .	337							
SWAINSON'S HAWK . . .	342	1/1					1/1	1/1
FERRUGINOUS HAWK . .	348	1/1					1/1	1/1
MARSH HAWK	331	3/3			2/2		5/5	5/5
AM. KESTREL	360	1/1	4/3		3/3		8/7	8/7
SHARP-TAIL. GROUSE . .	308			19/12	12/4	9/7	31/17	40/24
BOBWHITE	289							
RING-NECK PHEASANT . .	3091	18/11		29/21	65/31	0/10	112/67	122/77
GRAY PARTRIDGE	2881	2/1					2/1	2/1
SORA	214				2/2		2/2	2/2
AM. COOT	221					1/1		1/1
KILLDEER	273	14/7	8/7	31/13	6/6	11/8	59/28	70/46
COMMON SNipe	230							
LONG-BILLED CURLEW . .	264			1/1	3/3		4/4	4/4
UPLAND SANDPIPER . . .	261				5/1		5/1	5/1
SPOTTED SANDPIPER . .	263				X	1/1	X	1/1
WILLET	258					3/2		3/2
MARBLED GODWIT	249							
AM. AVOCET	225							
WILSON'S PHALAROPE . .	224	4/2		14/1		11/4	19/3	28/7
RING-BILLED GULL	054							
FRANKLIN'S GULL	059							
BLACK TERN	077							
ROCK DOVE	3131	5/1					5/1	5/1
MOURNING DOVE	316	4/17	47/26	77/31	16/30	24/22	266/101	294/113
YELLOW-BIL. CUCKOO . .	387							
BLACK-BILL CUCKOO . . .	388							
GREAT HORNED OWL . . .	375		2/2	1/1	1/1		4/4	4/4
HURROWING OWL	378				1/1		1/1	1/1
SHORT-EARED OWL	367	X			1/1		1/1	1/1
COMMON NIGHT HAWK . .	420		X				X	X
CHIMNEY SWIFT	423							
BELTED KINGFISHER . . .	390							
YEL-SHAFT FLICKER . . .	412							
RED-SHAFT FLICKER . . .	413		1/1	2/2	1/6		12/11	12/9
RED-HD. WOODPECKER . .	406				6/4		6/4	6/4
HAIRY WOODPECKER . . .	393							
DOWNY WOODPECKER . . .	394							
E. KINGBIRD	444	3/3	2/2	4/4	4/9	14/12	18/15	12/30
W. KINGBIRD	447	6/3			1/1	1/1	7/4	8/5
GT. CREST FLYCATCHER . .	452							
E. PHOEBE	456							
SAY'S PHOEBE	457	5/4	3/3		2/2	5/5	10/9	15/14
WILLOW FLYCATCHER . . .	4664							
EAST FLYCATCHER	467	1/1		2/1			3/2	3/2
E. WOOD PEWEE	461							
W. WOOD PEWEE	462							
HORNED LARK	474	405/4	64/22	106/27	47/14	136/41	626/117	762/151
TREE SWALLOW	614							
BANK SWALLOW	616							
ROUGH-WG. SWALLOW . .	617		4/2	1/1			5/3	5/3

Species	AOU	ROUTE					TOTAL EXCL. MISC.	TOTAL MISC.
		C	F	P	M	D	EXCLUDED	INCLUDED
BARN SWALLOW	613	3/1	9/7	13/8	8/6	1/1	73/22	74/23
CLIFF SWALLOW	612	18/3	20/11		16/1	1/1	384/15	385/16
PURPLE MARTIN	611							
BLUE JAY	477							
BLK-BILLED MAGPIE . . .	475			2/1	23/14	8/4	25/15	30/17
COMMON CROW	488	1/1			10/6		11/7	11/7
BLK-CAP. CHICKADEE . .	735				1/1		1/1	1/1
WHITE-BR. NUTHATCH . . .	727							
HOUSE WREN	721			3/2	12/10		15/12	15/12
LONG-BIL MARSH WREN . .	725							
SHORT-B. MARSH WREN . .	724							
ROCK WREN	715	1/1	10/21	5/2	1/1	3/3	46/25	49/28
GRAY CATBIRD	704	1/1			1/1		2/2	2/2
BROWN THRASHER	705	2/2	X	3/2	24/14	26/14	29/13	49/32
SAGE THRASHER	702		1/1				1/1	1/1
AM. ROBIN	761	1/1	1/1	2/2	4/4		8/8	8/8
VEERY	756							
E. BLUEBIRD	766							
MOUNTAIN BLUEBIRD . . .	768							
SPRAGUE'S PIPIT	700		3/3	2/2	1/1	4/4	6/6	10/10
CEDAR WAXWING	619							
LOGGERHEAD SHRIKE . . .	622	2/2	3/2	2/2	3/3	6/3	10/9	16/12
STARLING	493	6/4	3/1		17/7	7/2	26/12	33/14
RED-EYED VIREO	624							
WARBLING VIREO	627							
YELLOW WARBLER	652	3/2		8/4	13/8	9/6	24/14	33/20
COM. YELLOWTHROAT . . .	681		1/1	6/5	16/10	2/1	23/16	25/17
YELLOW-BR. CHAT	683			1/1	1/1		2/2	2/2
AM. REDSTART	687							
HOUSE SPARROW	6882	45/6		6/2	23/4	6/1	79/12	85/13
BOBOLINK	494							
W. MEADOWLARK	5011	173/50	244/50	245/46	254/42	234/50	721/146	1155/44
YEL-HD. BLACKBIRD . . .	497	3/2			4/2		7/4	7/4
RED-WG. BLACKBIRD . . .	498	63/25	21/10	41/17	115/17	31/10	240/69	271/19
ORCHARD ORIOLE	506							
N. BALTIMORE ORIOLE . . .	507	1/1		1/1	1/1		3/3	3/3
BULLOCK'S ORIOLE	508							
BREWER'S BLACKBIRD . . .	510		6/6	7/4	43/13	16/8	56/23	74/31
COMMON GRACKLE	511	2/1			6/5		8/6	8/6
BROWN-HD. COWBIRD . . .	495	17/16	15/12	27/19	29/16	10/7	38/58	78/65
ROSE-BR. GROSBEAK . . .	595							
BLACK-HD. GROSBEAK . . .	596							
BLUE GROSBEAK	597							
INDIGO BUNTING	598							
LAZULI BUNTING	599							
DICKCISSEL	604							
AM. GOLDFINCH	529			1/1	6/4		7/5	7/5
RUFOUS-SIDE TOWHEE . . .	587	2/1	1/1	8/5	18/14	10/7	29/21	39/25
LARK BUNTING	605	99/36	60/17	123/26	1/1	101/10	223/24	283/54
SAVANNAH SPARROW	542	12/7					12/7	12/7
GRASSHOPPER SPARROW . .	546	4/3	2/2	2/2	1/1	10/7	9/8	19/15
BAIRD'S SPARROW	545	1/3			1/1		5/5	4/4
VESPER SPARROW	540	11/7	46/25	25/16	14/11	30/17	96/54	126/70
LARK SPARROW	552	1/1	9/7	2/2	29/14	2/2	36/24	72/26
CHIPPING SPARROW	560	7/4	2/1			1/1	9/5	10/6
CLAY-COL. SPARROW . . .	561		2/1	5/5	14/12		21/13	21/13
BREWER'S SPARROW	562		57/23	27/14	5/2	8/4	87/34	91/48
FIELD SPARROW	563		2/1	3/3	75/14		40/22	40/22
SWAMP SPARROW	584							
SONG SPARROW	581				1/1	5/4	6/5	6/5
MCCOWN'S LONGSPUR . . .	539	2/2					2/2	2/2
CH-COL. LONGSPUR	538	16/37	31/11	1/1		62/23	193/49	255/12
PAINE'S FALCON		1/1					1/1	1/1
RING-NECKED PUCKER . . .		2/1					2/1	2/1
HARRIS' SPARROW		1/1					1/1	1/1
MERLIN		1/1					1/1	1/1
CANADA GOOSE			5/1	2/2	7/2		14/5	14/5
L.B. SNOWBUNTER				5/1			5/1	5/1
TENNESSEE WARBLER					1/1		1/1	1/1
TURKEY VULTURE					6/1		6/1	6/1
HORNED GREBE						1/1	1/1	1/1
GOLDEN EAGLE						2/1	2/1	2/1

JUNE 1978

APPENDIX D (continued)

Species	AOU	ROUTE					TOTAL CYCL PER YEAR	TOTAL INCL PER YEAR
		C	F	P	M	D		
PIED-BILLED GREBE . . .	006							
DBL-CR. CORMORANT . . .	120		1/1				1/1	1/1
GREAT BLUE HERON . . .	194		1/1				1/1	1/1
BLK-CR. NIGHT HERON . . .	202							
AM. BITTERN	190							
MALLARD	132	7/1	1/1		2/1	11/4	10/3	21/7
GADWALL	135					1/1		1/1
PINTAIL	143							
GREEN-WINGED TEAL . . .	139							
BLUE-WINGED TEAL . . .	140	2/1		2/2		3/3	4/3	7/6
AM. WIGEON	137	10/3				7/4	10/7	17/7
N. SHOVELER	142	2/1				3/2	2/1	5/3
WOOD DUCK	144							
REDHEAD	146							
CANVASBACK	147							
LESSER SCAUP	149	3/1					3/3	3/1
RUDDY DUCK	167							
RED-TAILED HAWK . . .	337		1/1				1/1	1/1
SWAINSON'S HAWK . . .	342	1/1					1/1	1/1
FERRUGINOUS HAWK . . .	348							
MARSH HAWK	331	3/3	1/1	1/1		3/3	5/5	8/8
AM. KESTREL	360	1/1	1/1	1/1	5/4		3/7	2/7
SHARP-TAIL. GROUSE . . .	308			4/3	1/1	1/1	5/4	6/5
BOBWHITE	289							
RING-NECK PHEASANT . . .	3091	14/9		22/18	51/30	3/3	93/57	146/60
GRAY PARTRIDGE	2881	1/1					1/1	1/1
SORA	214	2/2		1/1			3/3	3/7
AM. COOT	221	1/1				1/1	1/1	2/2
KILLDEER	273	13/7	14/13	23/16	13/12	17/11	67/48	55/54
COMMON SNIFE	230							
LONG-BILLED CURLEW . . .	264			2/2			2/2	2/2
UPLAND SANDPIPER . . .	261			5/4	2/2		7/6	7/6
SPOTTED SANDPIPER . . .	263					1/1		1/1
WILLET	258			6/3	3/2		6/3	4/5
MARbled GODWIT	249							
AM. AVOCET	225							
WILSON'S PHALAROPE . . .	224		5/1		5/1		5/1	10/2
RING-BILLED GULL	054	8/1			4/2		17/3	17/3
FRANKLIN'S GULL	059							
BLACK TERN	077							
ROCK DOVE	3131	5/2					5/2	5/2
MOURNING DOVE	316	50/21	70/22	56/30	15/21	26/16	211/105	237/121
YELLOW-BIL. CUCKOO . . .	387							
BLACK-BILL CUCKOO . . .	388		1/1	3/3			4/4	4/4
GREAT HORNED OWL . . .	375							
BURROWING OWL	378	1/1		2/1			3/2	3/2
SHORT-EARED OWL	367							
COMMON Nighthawk	420	7/6	7/5	5/2	1/1		19/13	20/14
CHIMNEY SWIFT	423							
BELTED KINGFISHER . . .	390							
YEL-SHAFT FLICKER . . .	412							
RED-SHAFT FLICKER . . .	413	1/1		10/7			11/8	11/8
RED-HD. WOODPECKER . . .	406			1/1			1/1	1/1
HAIRY WOODPECKER . . .	393							
DOWNY WOODPECKER . . .	394							
E. KINGBIRD	444	7/5	5/3	14/10	15/12	15/12	51/40	66/52
W. KINGBIRD	447	5/2		1/1			6/3	6/3
GT. CREST FLYCATCHER . . .	452							
E. PHOEBE	456							
SAY'S PHOEBE	457	5/5	10/8	3/3	2/2	1/1	20/18	21/19
WILLOW FLYCATCHER . . .	4664							
LEAST FLYCATCHER	467	1/1		2/2			3/3	3/3
E. WOOD PEWEE	461							
W. WOOD PEWEE	462							
HORNED LARK	474	423/47	46/24	79/29	25/8	119/32	573/167	662/40
TREE SWALLOW	614							
BANK SWALLOW	616	2/1	2/1		3/1	4/2	7/3	
ROUGH-WG. SWALLOW . . .	817							

Species	AOU	Route					F/L	T/L
		C	E	S	A	D		
PIED-BILLED GREBE	006					1/1		1/1
PBL-CR. CORMORANT	120		1/1			1/1	1/1	2/2
GREAT BLUE HERON	194				2/2		2/2	2/2
BLK-CR. NIGHT HERON	202							
AM. BITTERN	190							
MALLARD	132			5/1	2/1		7/2	7/2
GADWALL	135					7/1		7/1
PINTAIL	143							
GREEN-WINGED TEAL	139							
BLUE-WINGED TEAL	140	1/1				5/1	1/1	6/2
AM. WIGEON	137			4/1		4/1	1/1	17/2
N. SHOVELER	142							
WOOD DUCK	144							
REDHEAD	146							
CANVASBACK	147							
LESSER SCAUP	149							
RUDDY DUCK	167							
RED-TAILED HAWK	337					1/1		1/1
SWAINSON'S HAWK	342	3/2					3/2	3/2
FERRUGINOUS HAWK	348					1/1		1/1
MARSH HAWK	331	2/2	1/1	2/2	2/2	3/3	7/7	10/10
AM. KESTREL	360	6/6		2/1	8/6	1/1	16/17	17/14
SHARP-TAIL, GROUSE	308				2/2		2/2	7/2
BOBWHITE	289							
RING-NECK PHEASANT	3091	10/7		3/3	15/11	1/1	28/21	27/22
GRAY PARTRIDGE	2881	1/1					1/1	1/1
SORA	214							
AM. COOT	221	4/1				2/1	4/1	6/2
KILLDEER	273	21/4	4/3	19/15	4/7	17/10	53/36	68/46
COMMON SNIFE	230							
LONG-BILLED CURLEW	264					X		X
UPLAND SANDPIPER	261	2/2		3/3	7/2		3/7	5/7
SPOTTED SANDPIPER	263				1/1		1/1	1/1
WILLET	258							
MARBLED GODWIT	249							
AM. AVOCET	225							
WILSON'S PHALAROPE	224							
RING-BILLED GULL	054	3/2	2/1		1/1	2/2	6/4	8/6
FRANKLIN'S GULL	059							
BLACK TURN	077							
ROCK DOVE	3131	10/2					10/2	10/2
MOURNING DOVE	316	31/16	31/25	10/31	107/11	31/17	244/102	150/121
YELLOW-BIL. CUCKOO	387							
BLACK-BILL CUCKOO	388			1/1			1/1	1/1
GREAT HORNED OWL	375							
HURROWING OWL	378							
SHORT-EARED OWL	367	1/1					1/1	1/1
COMMON NIGHTHAWK	420		7/7	1/6	5/7	9/5	23/16	32/21
CHIMNEY SWIFT	423							
BELTED KINGFISHER	390							
YEL-SHAFT FLICKER	412							
RED-SHAFT FLICKER	413			1/1	3/3		4/4	4/4
RED-HD. WOODPECKER	406							
HAIRY WOODPECKER	393							
DOWNY WOODPECKER	394							
E. KINGBIRD	444	5/4	2/2	11/10	28/21	23/16	46/37	69/53
W. KINGBIRD	447	12/5		1/1	3/2		16/8	16/8
GT. CREST FLYCATCHER	452							
E. PHOEBE	456							
SAY'S PHOEBE	457	4/4	2/2	3/3		1/1	8/4	10/10
WILLOW FLYCATCHER	4664							
LEAST FLYCATCHER	467	1/1		2/2			7/7	3/3
E. WOOD PEWEE	461							
W. WOOD PEWEE	462							
HORNED LARK	474	11/4	44/14	74/24	10/8	68/18	50/37	56/117
TREE SWALLOW	614							
BANK SWALLOW	616			1/1			1/1	1/1
ROUGH-WG. SWALLOW	617			1/1	1/1	2/1	2/2	4/3

Species	AOU	ROUTE				E-L	N-L	
		C	F	P	D			
BARN SWALLOW . . .	613	8/5	2/2	11/6	4/3	2/2	28/16	30/18
CLIFF SWALLOW . . .	612	76/13	45/2	3/1	15/1	67/7	552/43	615/50
PURPLE MARTIN . . .	611							
BLUE JAY.	477							
BLK-BILLED MAGPIE .	475		3/3	1/1	21/14	9/6	25/13	34/24
COMMON CROW . . .	488				12/9		12/9	12/4
BLK-CAP. CHICKADEE	735				3/2		3/2	3/2
WHITE-BR. NUTHATCH	727							
HOUSE WREN	721	2/2	1/1	3/3	14/12		20/18	20/18
LONG-BIL MARSH WREN	725							
SHORT-B. MARSH WREN	724							
ROCK WREN.	715	2/1	31/14	2/2		5/4	35/22	46/16
GRAY CATBIRD. . . .	704				3/2		3/2	3/2
BROWN THRASHER . .	705			3/3	4/7	6/2	12/10	18/12
SAGE THRASHER . . .	702							
AM. ROBIN.	761	3/2		4/4	4/4	1/1	11/10	12/11
VEERY.	756							
E. BLUEBIRD	766							
MOUNTAIN BLUEBIRD	768		1/1				1/1	1/1
SPRAGUE'S PIPIT . . .	700		1/1	2/2	3/3	14/13	6/6	10/19
CEDAR WAXWING . .	619				2/1		2/1	1/1
LOGGERHEAD SHRIKE.	622		10/8	16/10	11/7	15/9	37/25	52/34
STARLING.	493	5/2	2/1		5/3		12/6	12/6
RED-EYED VIREO . . .	624				1/1		1/1	1/1
WARBLING VIREO. . .	627							
YELLOW WARBLER . .	652			2/2	2/2		4/4	4/4
COM. YELLOWTHROAT	681	11/6		5/3	8/6	2/2	22/15	24/17
YELLOW-BR. CHAT. .	683			3/1	16/6		13/7	15/7
AM. REDSTART. . . .	687							
HOUSE SPARROW . . .	6882	58/8	6/2	6/2	12/4	7/2	32/16	53/18
BOBOLINK.	494					1/1		1/1
W. MEADOWLARK . . .	5011	73/44	196/4	196/47	144/4	196/47	627/51	535/32
YEL.-HD. BLACKBIRD.	497				2/1	4/1	2/1	11/2
RED-WG. BLACKBIRD.	498	140/31	2/2	31/10	45/25	53/15	276/68	324/63
ORCHARD ORIOLE . .	506							
BALTIMORE ORIOLE .	507	1/1		2/1			3/2	3/2
BULLOCK'S ORIOLE .	508							
BREWER'S BLACKBIRD.	510	1/1	4/4	4/3	14/7	110/10	73/15	143/23
COMMON GRACKLE .	511							
BROWN-HD. COWBIRD	495		11/5	8/4	3/3	67/7	22/12	81/19
ROSE-BR. GROSBEEK.	595							
BLACK-HD. GROSBEEK	596							
BLUE GROSBEEK . . .	597							
INDIGO BUNTING . .	598							
LAZULI BUNTING . .	599							
DICKCISSEL.	604							
AM. GOLDFINCH . . .	529	1/1		2/2	4/2		7/5	7/5
RUFous-SIDE TOWHEE	587		2/2	10/7	27/20	6/4	31/24	45/33
LARK BUNTING. . . .	605	23/14	144/38	213/12	2/2	17/27	457/87	552/116
SAVANNAH SPARROW	542	12/7				2/1	12/7	14/8
GRASSHOPPER SPARROW	546	8/6	12/17	26/16	5/4	35/20	57/34	47/38
BAIRD'S SPARROW. . .	545	42/26	5/4	5/5		12/18	52/35	87/53
VESPER SPARROW . . .	540	1/6	56/28	31/16	70/17	23/15	128/67	111/87
LARK SPARROW	552	1/1	1/8	3/3	20/13	5/3	33/25	38/23
CHIPPING SPARROW. .	560	1/1	1/1	11/6	10/11	2/2	23/1	25/11
CLAY-COL. SPARROW	561	1/1	1/1	2/2	21/14	1/1	25/18	46/19
BREWER'S SPARROW. .	562		56/26	24/10		7/5	60/76	87/4
FIELD SPARROW. . . .	563			11/10	42/27		53/37	53/37
SWAMP SPARROW. . .	584							
SONG SPARROW. . . .	581							
MCCOWN'S LONGSPUR	539							
CH-COL. LONGSPUR .	538	114/7	10/4			1/1	57/22	125/71
LONGSPUR.						X	X	X
LONGSPUR.								
LONGSPUR.						2/1		2/1
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